Service Hints

VOLUME THREE

COMPILED AND PUBLISHED BY

SYLVANIA
ELECTRIC PRODUCTS INC.

SERVICE HINTS

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COMPILED AND PUBLISHED BY

SYLVANIA ELECTRIC PRODUCTS INC.

MANUFACTURERS OF

Sylvania Radio Tubes, Fluorescent Lamps and Fixtures,
Incandescent Lamps, Electronic Devices

EMPORIUM, PENNA.

PLANTS IN PENNSYLVANIA AND MASSACHUSETTS

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FOREWORD

WHEN we started publishing technical data for the trade back in the late twenties there was little thought that this service would grow to its present proportions, and that it would come to be recognized by the radio industry of the entire world as being the most complete available.

Fundamental data such as are contained in the Sylvania Technical Manual, the Tube Complement Book, the Characteristic Sheet, the Tube Base Chart, are necessary to an understanding of the functions of radio tubes in receivers.

In addition, a great deal of practical technical information, not available elsewhere, has been supplied through Sylvania News. The Service Exchange Department of the News has proved a very helpful means of distributing service tips contributed by servicemen as the result of their own experience in solving difficult and unusual problems. If the many letters we receive are any indication, thousands of dollars and thousands of hours of valuable time have been saved for servicemen through the use of this information.

From the first, due to the interest and cooperation of servicemen, the available service hints have been far more than sufficient to fill the space that could be allotted to them in Sylvania News. From time to time it is our practice to compile both published and unpublished data in a handy Service Hints Booklet, which has been highly popular. We hope that you will find this third edition of Service Hints as helpful as the past volumes have been.

SYLVANIA ELECTRIC PRODUCTS INC.

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USEFUL TABLES

SERVICE HINTS (By Makes of Receivers)

GENERAL ENGINEERING INFORMATION

Ohm's Law: When a continuous current is flowing thru a given conductor, whose temperature is maintained constant, the ratio of the potential difference or voltage existing between the conductor terminals and the current carried by the conductor is a constant, no matter what the value of the current may be. The mathematical formulas for Ohm's Law may be expressed in the following forms:

$$R=\frac{E}{I} \qquad I=\frac{E}{R} \qquad E=IR$$

Where E = voltage in volts.
I = current in amperes.
R = resistance in ohms.

A practical example is given to illustrate the use of Ohm's Law: If the screen current for a certain tube is 2 milliamperes (0.002 ampere) what value of resistance should be used to reduce the screen voltage to 90 volts from a supply voltage of 250 volts?

SOLUTION: The required voltage drop across the resistor would be 250 − 90 or 160 volts.

$$\text{Therefore } R=\frac{E}{I}=\frac{160 \text{ volts}}{0.002 \text{ ampere}}=80{,}000 \text{ ohms},$$

Power: Power is the time rate of doing work. Since energy is the ability to do work, power may also be defined as the time rate of expending energy. From the fundamental definitions of power, electromotive force and current it is easy to show that power may be computed from the following expression:

$$P=EI$$

Where P = power in watts.
E = voltage in volts.
I = current in amperes.

Other ways of expressing power are:

$$P=I^2R \qquad \text{or} \qquad P=\frac{E^2}{R}$$

An example of how the power equation may be used in ordinary service work would be to determine the wattage rating of the resistor which was calculated in the problem under Ohm's Law.

$P = EI = 160 \times .002 = .320$ watts

Use .5 watt resistor.

Resistors Connected in Series and in Parallel: When two or more resistors are connected in series, so that the same current flows through each resistor, the total effective resistance (R_t) of the network will be the sum of the separate resistances. Thus:

$$R_t = R_1 + R_2 + R_3$$

If a number of resistors are connected in parallel so that the voltage drop is the same across each resistor, then the current in each resistor will be inversely proportional to the resistances. The total effective resistance (R_t) of the network, will be given by:

$$\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

For the case of two resistors in parallel:

$$R_t = \frac{R_1 R_2}{R_1 + R_2}$$

Calculation of Condensers in Series and in Parallel: When a number of condensers are connected in series, the total effective capacity (C_t) is computed from the relation:

$$\frac{1}{C_t} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$$

For the case of two condensers connected in series this expression reduces to the form:

$$C_t = \frac{C_1 C_2}{C_1 + C_2}$$

The total capacity (C_t) of any number of condensers connected in parallel is the sum of the separate capacities:

$$C_t = C_1 + C_2 + C_3$$

GENERAL ENGINEERING INFORMATION
Continued

Calculation of Proper Resistor for Self-biasing: From Ohm's Law.

$$R = \frac{\text{Grid Bias in Volts} \times 1000}{\text{Total Cathode Current in Ma.} \times \text{Number of Tubes Involved}}$$

For triodes the total cathode current is equal to the plate current. For tetrodes and pentodes the total cathode current is the sum of the plate and screen currents.
For pentagrid converters the plate, screen and oscillator anode currents must be added to obtain the total cathode current.

EXAMPLE: What biasing resistor is required for two Type 42 tubes operated in push-pull with 250 volts applied to the plates?

The following data are taken from the characteristics shown for Type 42:

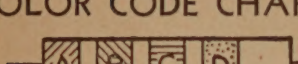
Grid Bias = 16.5 Volts
Plate Current = 34.0 Ma.
Screen Current = 7.5 Ma.
Total Cathode Current = 41.5 Ma.

$$\text{Hence: } R = \frac{16.5 \times 1000}{41.5 \times 2} = \frac{16500}{83} = 198 \text{ ohms}$$

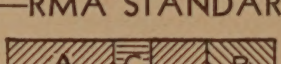
When over-biased operation is employed the recommended bias resistor values will be specified under Ratings or Circuit Application notes for the tube type involved.

USEFUL TABLES

COLOR CODE CHART—RMA STANDARD



AXIAL TYPE LEADS



RADIAL TYPE LEADS

A		B		C		D	
Black	0	Black	0				
Brown	1	Brown	1	Brown	0		
Red	2	Red	2	Red	00	No Color	±20%
Orange	3	Orange	3	Orange	000		
Yellow	4	Yellow	4	Yellow	0000	Silver	±10%
Green	5	Green	5	Green	00000		
Blue	6	Blue	6	Blue	000000		
Purple	7	Purple	7	Purple	0000000	Gold	± 5%
Gray	8	Gray	8	Gray	00000000		
White	9	White	9	White	000000000		

Resistor Color Code. The A color of a resistor denotes the first significant figure, the B color the second significant figure and the C color indicates the number of ciphers after the first two significant figures. The D color denotes the tolerance value of the resistor.

Example:

Band A (Axial Type) or Body (Radial Type) = Red
Band B (Axial Type) or End (Radial Type) = Green
Band C (Axial Type) or Dot (Radial Type) = Orange
Value of Resistor = 25000 Ohms

Molded Resistors. Some molded resistors look like small narrow mica condensers. These are ordinarily black and are marked with three colored dots. The dot colors are read in proper order the same as the body, end and dot colors on regular carbon resistors.

Flexible Resistors. Flexible fabric covered wire-wound resistors are coded the same as carbon resistors. Some have the colors woven into the fabric. The smallest thread color is read as the dot; the larger thread grouping as the end, and the body color as usual.

Odd Value Resistors. All resistors necessarily are apt to vary somewhat from rated value. Parts are nominally held to plus or minus 10%. Some uses permit a wider tolerance of 20%. In order to distinguish the wide limit parts from the 10% limit parts, the second figure is increased by one in the wide limit parts. That is, a 100,000 ohm resistor would nominally be ± 10%, while a 110,000 ohm value would be ± 20%. The even values can, of course, be substituted for the wide limit odd values, but not vice versa. An odd value not in conformity with this practice, as 1200 ohms, is usually a close tolerance value and should be replaced with identical resistor.

CONDENSER COLOR CODE

FOR MICA CONDENSERS

Inasmuch as the R.M.A. color coding has been extended to cover molded condensers it becomes desirable that servicemen memorize the standard color code so that they can identify the values of the parts marked in code practically at a glance. The standard R.M.A. color code is shown on the preceeding page.

Molded mica condenser values are expressed in micromicrofarads by the color code. A micromicrofarad ($\mu\mu$f.) is one millionth of a microfarad (μf.). To convert μf. to $\mu\mu$f. move the decimal point six places to the right or to convert $\mu\mu$f. to μf. move the decimal point six places to the left. For example: .00025 μf. is 250 $\mu\mu$f. or 250 $\mu\mu$f. is .00025 μf. Refer to the Condenser Conversion Chart on the opposite page for conversion values.

In most cases the value of mica condensers is marked on the cases with three colored dots representing $\mu\mu$f. capacity. The first color indicates the first figure, the second color indicates the second figure, and the third color indicates the number of zeros.

In order to distinguish the sequence of reading the colors, some dots are pointed in the direction to be read, others have an adjacent arrow, while some have no clue to direction except the printing on the case.

By way of example, several typical values are shown below:

First Dot (1st Figure)	Green (5)	Yellow (4)	Orange (3)
Second Dot (2nd Figure)	Brown (1)	Red (2)	Black (0)
Third Dot (No. of Zeros)	Black (No Zero)	Brown (1 Zero)	Red (2 Zeros)
Capacity	51 $\mu\mu$f. or .000051 μf.	420 $\mu\mu$f. or .00042 μf.	3000 $\mu\mu$f. or .003 μf.

NOTE: Some mica condensers may have a fourth dot or stripe. This indicates capacity tolerance. Example:—Green marking below the regular three dots indicates a 5% tolerance.

CONDENSER CONVERSION CHART

The values of condensers used in radios are expressed in microfarads (μf.) or micromicrofarads (μμf.). A micromicrofarad is one millionth of a microfarad. To convert μf. to μμf. move the decimal point six places to the right. To convert μμf. to μf. move the decimal point six places to the left. The following is a conversion of the more popular condenser values.

μf.	μμf.
.000001	1.0
.0000025	2.5
.000005	5
.00001	10
.000025	25
.00003	30
.00004	40
.00005	50
.0001	100
.00015	150
.0002	200
.00025	250
.0003	300
.0004	400
.0005	500
.0008	800
.001	1000
.0015	1500
.002	2000
.0025	2500
.003	3000
.004	4000
.005	5000
.006	6000
.007	7000
.008	8000
.01	10,000
.015	15,000
.02	20,000
.03	30,000
.04	40,000
.05	50,000
.06	60,000
.1	100,000
.25	250,000
.5	500,000
1.0	1,000,000

CONVERSION TABLE

MULTIPLY	BY	TO OBTAIN
Amperes	× 1,000,000,000,000	Micromicroamperes
Amperes	× 1,000,000	Microamperes
Amperes	× 1,000	Milliamperes
Cycles	× .000,001	Megacycles
Cycles	× .001	Kilocycles
Farads	× 1,000,000,000,000	Micromicrofarads or Picofarads
Farads	× 1,000,000	Microfarads
Farads	× 1,000	Millifarads
Henrys	× 1,000,000	Microhenrys
Henrys	× 1,000	Millihenrys
Horsepower	× .7457	Kilowatts
Horsepower	× 745.7	Watts
Kilocycles	× 1,000	Cycles
Kilovolts	× 1,000	Volts
Kilowatts	× 1,000	Watts
Kilowatts	× 1.341	Horsepower
Megacycles	× 1,000,000	Cycles
Mhos	× 1,000,000	Micromhos
Mhos	× 1,000	Millimhos
Microamperes	× .000,001	Amperes
Microfarads	× .000,001	Farads
Microhenrys	× .000,001	Henrys
Micromhos	× .000,001	Mhos
Micro-ohms	× .000,001	Ohms
Microvolts	× .000,001	Volts
Microwatts	× .000,001	Watts
Micromicrofarads	× .000,000 000,001	Farads
Micromicro-ohms	× .000,000,000,001	Ohms
Milliamperes	× .001	Amperes
Millihenrys	× .001	Henrys
Millimhos	× .001	Mhos
Milliohms	× .001	Ohms
Millivolts	× .001	Volts
Milliwatts	× .001	Watts
Ohms	× 1,000,000,000,000	Micromicro-ohms
Ohms	× 1,000,000	Micro-ohms
Ohms	× 1,000	Milliohms
Volts	× 1,000,000	Microvolts
Volts	× 1,000	Millivolts
Watts	× 1,000,000	Microwatts
Watts	× 1,000	Milliwatts
Watts	× .001	Kilowatts

COPPER WIRE TABLE

The Resistance Measurements given in this Table are of Pure Copper Wire in International Ohms at 20° C. or 68° F. Ordinary Commercial Copper Wire has a Resistance from 3 to 5 per cent Greater.

Gauge No.	Diameter mils. *	Area circular mils.	Wt. in lbs. per 1,000 feet	Feet per lb.	Resistance of Pure Copper at 20 C. or 68 F. Ohms per Foot	Feet per Ohm	Ohms per lb.
0000	460.0	211,600	640.5	1.56	0.0000489	20,440	0.0000763
000	409.6	167,800	508.0	1.97	0.0000617	16,210	0.0001215
00	364.8	133,100	402.8	2.49	0.0000776	12,850	0.0001931
0	324.9	105,600	319.5	3.13	0.0000981	10,190	0.0003071
1	289.3	83,690	253.3	3.95	0.0001237	8,083	0.0004883
2	257.6	66,370	200.9	4.98	0.0001560	6,410	0.0007763
3	229.4	52,630	159.3	6.28	0.0001967	5,084	0.001235
4	204.3	41,740	126.4	7.91	0.0002480	4,031	0.001963
5	181.9	33,100	100.2	9.98	0.0003128	3,197	0.003122
6	162.0	26,250	79.46	12.58	0.0003944	2,535	0.004963
7	144.3	20,820	63.02	15.87	0.0004973	2,011	0.007892
8	128.5	16,510	49.98	20.01	0.0006271	1,595	0.01255
9	114.4	13,090	39.63	25.23	0.0007908	1,265	0.01995
10	101.9	10,380	31.43	31.85	0.0009972	1,003	0.03173
11	90.74	8,234	24.93	40.12	0.001257	795.5	0.05045
12	80.81	6,530	19.77	50.58	0.001586	630.5	0.08022
13	71.96	5,178	15.68	63.78	0.001999	500.1	0.1276
14	64.08	4,107	12.43	80.45	0.002521	396.6	0.2028
15	57.07	3,257	9.86	101.4	0.003179	314.5	0.3225
16	50.82	2,583	7.82	127.9	0.004009	249.4	0.5128
17	45.26	2,048	6.20	161.3	0.005055	197.8	0.8153
18	40.30	1,624	4.92	203.4	0.006374	156.9	1.296
19	35.89	1,288	3.90	256.5	0.008038	124.4	2.061
20	31.96	1,022	3.09	323.4	0.01014	98.62	3.278
21	28.46	810.1	2.45	407.8	0.01278	78.24	5.212
22	25.35	642.6	1.95	514.2	0.01612	62.05	8.287
23	22.57	509.5	1.54	648.4	0.02032	49.21	13.18
24	20.10	404.0	1.22	817.6	0.02563	39.02	20.95
25	17.90	320.4	0.97	1,031	0.03231	30.95	33.32
26	15.94	254.1	0.77	1,300	0.04075	24.54	52.97
27	14.20	201.5	0.61	1,639	0.05138	19.46	84.23
28	12.64	159.8	0.48	2,067	0.06479	15.43	133.9
29	11.26	126.7	0.38	2,607	0.08170	12.24	213.0
30	10.03	100.5	0.30	3,287	0.1030	9.707	338.6
31	8.928	79.71	0.24	4,145	0.1299	7.698	538.4
32	7.950	63.20	0.19	5,227	0.1638	6.105	856.2
33	7.080	50.13	0.15	6,591	0.2066	4.841	1,361
34	6.305	39.75	0.12	8,311	0.2605	3.839	2,165
35	5.615	31.52	0.10	10,840	0.3284	3.045	3,441
36	5.000	25.00	0.08	13,210	0.4142	2.414	5,473
37	4.453	19.83	0.06	16,660	0.5222	1.915	8,702
38	3.965	15.72	0.05	21,010	0.6585	1.519	13,870
39	3.531	12.47	0.04	26,500	0.8304	1.204	22,000
40	3.145	9.89	0.03	33,410	1.047	0.955	34,980

*For Diameter in inches divide Mils Diameter by 1,000;
EXAMPLE: 460 Mils Diameter ÷ 1,000 = .460 inch Diameter.

RESISTOR APPLICATION CHART

Current Carrying Capacity and Allowable Voltage that can be Applied to 3, 10, 25 and 50 Watt Resistors.

Watts.....3	3		10	10	25	25	50	50
Rcs.	Amp.	Volts	Amp.	Volts	Amp.	Volts	Amp.	Volts
1	1.730	1.730	3.163	3.163	5.000	5.000	7.070	7.070
1.5	1.410	2.115	2.572	3.858	4.083	6.124	5.773	8.659
2	1.224	2.448	2.235	4.470	3.420	6.840	5.000	10.000
2.5	1.097	2.742	2.000	5.100	3.154	7.885	4.474	11.185
3	1.000	3.000	1.835	5.505	2.939	8.817	4.083	12.249
3.5	.970	3.395	1.689	5.911	2.672	9.342	3.778	13.223
4	.866	3.440	1.579	6.316	2.500	10.000	3.420	13.680
5	.774	3.870	1.414	7.070	2.236	11.160	3.154	15.770
7.5	.632	4.740	1.154	8.655	1.826	13.695	2.581	19.357
10	.547	5.470	1.000	10.000	1.598	15.980	2.236	22.360
15	.447	6.705	.816	12.240	1.298	19.470	1.829	27.435
20	.389	7.780	.708	14.160	1.119	22.380	1.598	31.960
25	.346	8.650	.632	15.800	1.000	25.000	1.414	35.350
30	.316	9.480	.577	17.310	.912	27.360	1.298	38.940
35	.292	10.220	.534	18.690	.844	29.540	1.197	41.895
40	.274	10.960	.500	20.000	.791	31.640	1.119	44.760
50	.245	12.250	.447	22.350	.700	35.000	1.000	50.000
75	.200	15.000	.365	27.375	.574	43.050	.818	61.350
100	.173	17.300	.316	31.600	.500	50.000	.700	70.000
150	.141	21.150	.258	38.700	.432	64.800	.577	86.550
200	.122	24.400	.223	44.600	.353	70.600	.500	100.000
250	.109	27.250	.200	50.000	.316	79.000	.447	111.750
300	.100	30.000	.182	54.600	.291	87.800	.432	129.600
350	.097	33.950	.169	59.150	.269	94.150	.378	132.300
400	.086	34.400	.158	63.200	.250	100.000	.353	141.200
500	.077	38.500	.141	70.500	.224	112.000	.316	158.000
750	.063	46.650	.115	86.250	.186	139.500	.257	192.650
1,000	.054	54.000	.100	100.000	.158	158.000	.220	220.000
1,500	.044	66.000	.081	121.500	.129	193.500	.182	273.000
2,000	.038	76.000	.070	140.000	.112	224.000	.159	318.000
2,500	.034	85.500	.063	157.000	.100	250.000	.141	352.500
3,000	.031	93.000	.057	171.000	.091	273.000	.129	387.000
3,500	.030	105.000	.053	185.500	.085	297.500	.119	416.500
4,000	.027	108.800	.050	200.000	.079	316.000	.111	444.000
5,000	.024	120.000	.044	220.000	.071	355.000	.100	500.000
7,500	.020	150.000	.036	270.000	.058	445.000	.081	607.500
10,000	.017	170.000	.031	310.000	.050	500.000	.070	700.000
15,000	.014	210.000	.025	375.000	.043	645.000	.057	855.000
20,000	.012	240.000	.022	440.000	.035	700.000	.050	1,000.000
25,000	.011	265.000	.020	500.000	.031	775.000	.044	1,100.000
30,000	.010	300.000	.017	510.000	.029	870.000	.043	1,290.000
35,000	.009	315.000	.015	525.000	.026	910.000	.037	1,290.500
40,000	.008	320.000	.014	560.000	.025	1,000.000	.035	1,400.000
50,000	.007	350.000	.013	650.000	.022	1,100.000	.031	1,550.000
75,000	.006	450.000	.011	825.000	.018	1,350.000	.025	1,875.000
100,000	.005	540.000	.010	1,000.000	.015	1,500.000	.022	2,200.000

TAP AND DRILL SIZES

All metal drilling should be done with round twist drills which are obtainable in the sizes designated by numbers as in the table. When drilling brass, aluminum and cast iron, no lubricant is used. When drilling steel, the drill should be lubricated with light machine oil as it enters the hole.

Insulating materials such as Bakelite, Formica, Celoron, hard rubber, fibre, etc., should be drilled with the point of the drill ground to the usual sixty-degree angle but with the front edge of the cutting edge ground straight or flat to remove the hook. Speeds up to 1,500 rpm. may be used and the drill may be left dry, or lubricated with lard oil or light machine oil. Insulating materials of this kind are rather hard on the drills and dull the points quickly When the drill comes through the hole in the back it is advisable to hold a block of scrap wood solidly against the surface to prevent the material from chipping or breaking through around the edges.

Taps are used for cutting threads on the inside of holes. Dies are for threading the outside of rods or screws. The first part of each tap or die number indicates the gauge number of the rod stock from which the screws were cut, or the gauge number of the rod to be threaded, respectively. The second part of each number indicates the number of threads per inch which should correspond to the number of threads per inch on the screw or nut to be used.

SIZES OF TAP AND CLEARANCE DRILLS

Screw No.	Threads per Inch	Tap Size	Drill Number For Tap	Drill Number Clearance	Screw No.	Threads per Inch	Tap Size	Drill Number For Tap	Drill Number Clearance
2	48	2x48	No. 50	No. 42	8	24	8x24	No. 30	17
2	56	2x56	No. 48	No. 42	8	32	8x32	No. 28	18
2	64	2x64	No. 48	No. 42	10	24	10x24	No. 25	9
3	40	3x40	No. 47	No. 37	10	30	10x30	No. 22	8
3	48	3x48	No. 44	No. 37	10	32	10x32	No. 20	8
3	56	3x56	No. 44	No. 37	12	20	12x20	No. 19	1
4	32	4x32	No. 43	No. 31	12	24	12x24	No. 15	1
4	36	4x36	No. 41	No. 32	12	28	12x28	No. 15	1
4	40	4x40	No. 41	No. 31	14	20	14x20	No. 10	1/4
6	32	6x32	No. 33	No. 27	14	24	14x24	No. 6	1/4
6	36	6x36	No. 33	No. 26					

NOTE: Use one size larger drill for tapping Bakelite and hard rubber.

SERVICE HINTS

The following Service Hints have been contributed by servicemen as the result of practical experience. Each hint has been carefully considered before being accepted, and we believe them to be correct and authentic. However, we assume no responsibility with respect to results. Additional Service Hints are shown regularly in the Service Exchange of Sylvania News. Hints are welcomed and when accepted entitle the contributor to his choice of one Sylvania receiving tube for each hint. Don't send routine, duplicate or generally known information. Always specify tube choice.

Acratone 9A. Oscillation which is traced to the second r-f circuit is easily remedied by turning the second r-f coil at right angles to the antenna coil, or vice versa.—Geo. G. Baptiste, Howard, R. I.

Admiral 6 Volt Farm Set. A terrible vibrator noise which at times may drown out all reception may be caused by the following condition: The negative lead to the battery is composed of three wires in a cable, a heavy shield which goes to set ground and two small rubber covered wires. These two wires had parted in the covering and were not touching the shield wire. Resoldering these three wires together eliminates the noise. This set is also made by Continental Radio and sold under several well known trade names such as Knight, Mantola, Admiral, etc.—Bernard Greene, Petersburg, Va.

Airline 62-14. Signals at one end of the band only, usually means that the 40,000 ohm resistor from grid of the 27 oscillator tube to ground has changed resistance. Replace with a good metallized resistor and the trouble will be solved.—Wayne Storch, Beecher, Ill.

Airline 62-98. The volume control may be improved by using a 5000 ohm unit instead of 10,000 ohms and moving the .001 input blocking condenser to the rear of the chassis away from the antenna coil. To reduce hum and increase efficiency connect the cathodes of

the 25Z5 rectifier together and bypass with an 8 mfd. 200 volt tubular electrolytic condenser. For better tone replace the .006 condenser from the 43 plate to ground with a .05 unit.—Lap Radio Laboratory, Plainfield, N. J.

Airline 62-98, 62-104. The filter block and the .25 mfd. bypass in the control grid return of the 43 output tube often gives trouble. In early sets the detector screen was connected to the positive supply. Later a 100,000 ohm resistor was added in series with the screen and bypassed with a .25 mfd., 200 volt condenser at the screen end to prevent overloading and oscillation. Check to be sure these are present.—Henry Berg, Pittsburgh, Pa.

Airline 62-154. The 13,000 ohm series section of the candohm resistor opens and a one watt **carbon** unit is a satisfactory replacement. When the one antenna choke is burned out and no replacement is at hand, check the small shunt condenser for leakage and, if OK use it across the remaining choke, if not OK, use a .005 to .001 mfd. unit across the choke with the antenna connected to the high end.—Henry Berg, Pittsburgh, Pa.

Airline 62-160. To eliminate distortion and improve the tone quality on local stations, replace the 2 megohm bias resistor connected between the control grid and the positive filament contact of the 34 second detector tube with a 750,000 ohm resistor This distortion will be found to be quite severe on local stations when about three-fourths of the B battery's life has been used.—Clarence Camper, Bristol, Tenn.

Airline 62-226. When this set is found with no a-v-c action and an inoperative "tuning eye," check the blocking condenser C5, .05 mfd. in the 6K7 r-f tube grid return. To improve the a-v-c action and for sharper operation on the 6E5 indication, change resistor R21 to a 2.0 megohm unit.—A. B. Chismar, Streator, Ill.

Airline 62-249. When the tuning eye (6G5) on these sets does not operate (no control of shadow angle) check the one megohm resistor between the target and plate circuit. This resistor is mounted on the socket of the tuning eye, between the target and plate pin holes. As the space is somewhat small, there is quite a tension on the resistor. This tension often causes the resistor to break. Replace the broken resistor with a new ½ watt, one megohm unit.—M. Margossian, Oakland, Calif.

Airline 62-316. If this set will pick up short wave stations but no standard broadcast stations, try paralleling a new .0034 or .003 condenser across the C-6 condenser. It is one of the units next to the front of the chassis, of the pair from the waveband change-over switch of the 600 Kc. padding condenser. A condenser of near value will not restore reception.—Warren J. Dougherty, Kincaid, Kans.

American Bosch 670C. This set may cut off due to the wave band switch. Wiggling the switch will indicate the defect. Turn the set upside down and remove the entire coil unit, being careful to note how to reassemble. Clean the round movable plate and flow solder evenly over the entire surface on both sides. Since the contacts cannot be tightened, this remedy, which is a sure one, saves the price of a new switch.—Francis J. Kmetz, Allentown, Pa.

Ansley Universal AC-DC. These sets are often found inoperative with no B voltage on the r-f tubes. After having checked all bypass filter condensers for shorts and still not locating the trouble, check the shielded wire from the plate of the 39/44 tube to the first r-f coil for a short to the shielding. I have run across this condition several times in this particular model.—John H. Bloomer, Philadelphia, Pa.

Arvin 27. This radio has what seemed to be a high pitched audio squeal on all stations. The trouble was not found in the audio circuit however, but in the twin .05 condenser, bypassing the grid return from the r-f coil to the 78 tube and the grid return to the 6A7 oscillator circuit. These two condensers are used as bypass condensers and are known as C17A andC17B. The one in the oscillator circuit opened up, hence the trouble. Replace the twin condenser with two separate high efficiency condensers with good stout leads. Anchor them down tightly.—Keith Howard, Santa Ana, Calif.

Arvin 7, 17, 27, 37. Intermittent oscillation is often caused by a defective a-v-c condenser between the 78 tube and the antenna coil. Replace with a new condenser. In the Model 7, the condenser is located between the 6F7 tube socket and the antenna coil.—Doran's Radio Service, Martinsville, Ill.

Arvin Radios (All 1935 Models). Oscillation and motorboating in these sets is usually caused by the condenser located between the antenna coil and r-f tube. The capacity of this dual condenser is .05 and .05 mfd. at 160 volts. The voltage rating of the original is

apparently too low. In replacing use a 400 volt unit. This condenser is used as an a-v-c bypass and is Arvin part No. 17-4731. Orvil W. Carter, Coffeyville, Kans.

Atwater Kent 2. These receivers or any other battery models having the off-on switch controlling A and B voltages, will eventually give trouble until the jinx is found.

The set will work fine then suddenly quit, appearing to have gone out of oscillation. Simply change the double pole double throw toggle switch with a new one and your troubles will be over. Almost all of these models develop this trouble sooner or later.—V. M. Moen, Tracy, Minn.

Atwater Kent 72. I often find these models completely dead or just loud enough to be heard with the volume on full. The first thing to examine is the first audio filter resistor, located directly under and a little to the right of the first audio transformer. This resistor is white with a grey band around it. Replace with a 30,000 ohm, 1 watt unit. Due to the age of these resistors, some test open, others have a very high resistance and pass little or no plate voltage to the first audio tube.—H. L. Fornoff, Buffalo, N. Y.

Atwater Kent 89, 89F, 89P. Intermittent operation in these models is sometimes caused by the failing of the 800 ohm flexible bleeder resistor between screen and cathode of the 24A a-v-c control tube. You are usually able to make the set come on loud if you provide a path for grid return to ground on the control tube by touching your hand to the grid cap and the chassis. This kind of trouble is usually hard to locate as the resistor will check all right with the set turned on.—V. L. Crawford, Texarkana, Tex.

Atwater Kent 165. We have had several cases of severe distortion and loud hum in this receiver and have corrected it by the following method: Install a filter consisting of a 3000 ohm resistor and a 0.2 mfd. condenser in series with the B plus lead of the i-f transformer in the plate circuit of the 58 i-f amplifier tube. In severe cases it will be necessary to use a larger condenser. One set of this model which we repaired was so severe that it was necessary to use an 8 mfd. electrolytic condenser. However, this method cleared it up nicely, whereas before the slightest increase in volume made reception unbearable.—Clarence C. Fuller, Loxley, Ala.

Atwater Kent 480. When this set is dead on the low frequency end of the broadcast band, check the bypass on the plate circuit of

the 58 r-f tube. Often it shows high leakage and replacing it will cure the trouble. It is best to replace the oscillator tube with a Sylvania 56 as the circuit seems to be critical as to tubes. —Donald G. Buck, N. Tonawanda, N. Y.

Atwater Kent 812. Erratic reception, sometimes accompanied with noise and oscillation may be due to broken or loose connections to the .00145 mfd. condenser located inside the oscillator coil shield. Replace with a mica .0015 unit. Do not attempt to place the new unit in some other section of the set as it must be within the shield. Henry Burlington, Abington, Pa.

Audiola 23-S-10. This receiver has a neon tuning indicator which sometimes goes out of commission. There are two probable causes of such trouble; one is the resistor connected to the tuning indicator changing its value, and the other is a defective 1 mfd. condenser connecting to same. This condenser is often overlooked and it is always advisable to replace. The proper value of the tuning indicator resistor is 10,000 ohms. —Geo. F. Baptiste, Howard, R. I.

Balkeit 41A. Oscillation, which sometimes occurs in these receivers after they have been in operation a short time, can usually be traced to tube shields working loose or not fitting properly. A good kink is to solder flexible wire leads to all tube shields and ground each one to the chassis. —Geo. F. Baptiste, Howard, R. I.

Belmont 550. When plate voltage in these sets drops from around 300 volts to about 80 volts shortly after being turned on, look for a shorted i-f input transformer. The lugs inside the can sometimes short to the wire of the coils, providing a direct short from the 2A7 plate coil to the 58 grid coil. Remedy: Bend each lug away from the coil or snip off the ends of the lugs.—J. F. Lephart, Arcanum, Ohio

Belmont 685, 686A, 686B, 786A. If this set will pick up short wave stations but no standard broadcast stations, try paralleling a new .0034 or .003 condenser across the C-6 condenser. It is one of the units next to the front of the chassis, of the pair from the wave-band change-over switch of the 600 Kc. padding condenser. A condenser of near value will not restore reception. This hint also applies to the Airline Model 62-316. —Warren J. Dougherty, Kincaid, Kans.

Belmont Gamble 770 Series A, 777 Series B-C. In a few cases, difficulty has been experienced with intermittent hum. This

hum usually appears only after the receiver has been allowed to operate for some time and temporarily disappears upon snapping the line switch off and on. The difficulty is generally due to the opening of the common lead of the dual condenser (.1—.25 part No. 118-12), at the point of attachment to the condenser coil.

This dual condenser is indicated as C-18 and C-14 on the circuit diagram C-14 being the .1 mfd. 200 volt screen bypass of the 6B7, while C-18 is a .25 mfd. 200 volt unit acting as a filter for the bias voltage of the type 42 tube. Examination of the circuit will show that when this occurs, the entire hum voltage of the filter is impressed on the screen of the type 6B7 tube. It is generally advisable to replace the entire unit with two separate units having ratings identical with the original unit.—Sidney E. Keepers, Pierre, S. D.

Belmont 777 Series B. Bad distortion and poor a-v-c action can be cured by replacing the 250,000 ohm, ½ watt, 6B7 plate load resistor even though it appears A-1 in value.

Improved tone and performance can be obtained by replacing the 180 ohm cathode resistor for the two 6D6 tubes with a ½ watt 300 ohm resistor. Oscillation and hum in these models is usually due to an open in the dual unit condenser #P-118-12 (0.1 mfd. and .25 mfd. C14 and C18 on the diagram). Replace these units with single section 0.1 mfd., 600 volt units.—N. E. Nelson, Mayville, N. D.

Belmont 778 Series B. If the set is intermittent or inoperative over lower portion of dial at about 1200 Kc. the bakelite condenser across the terminals of the low frequency trimmer may be open. The capacity of this condenser is .0005 mfd.—Tim W. Shaw, Vernon, Texas.

Bosch 48 Modernization. Replace the 24A sockets with standard 6 prong sockets for type 58 tubes. Connect the suppressor directly to the cathode of the socket. The type 27 tube is replaced by a type 56. The biasing and screen resistors remain the same due to the similarity of the tubes. The trimmers should then be rebalanced. This change results in higher sensitivity, better selectivity, clearer tone, and better control of volume.—Louis Freedman, Brooklyn, N. Y.

Bosch 58. Complaint: inoperative. Try touching the antenna or oscillator lead to the control grid of the first r-f (24A) on the right hand side next to the 27. If a signal comes through, check the variable condenser No. 1, for shorted plates. The rotor plates of the con-

denser are held to the shaft by small cap screws. These screws work off center until the rotor plates touch part or all of the stator plates.—Herbert Hass, Chicago, Ill.

Bosch 236. When distortion is the trouble in this model, replace the cathode resistor in the 57 second detector tube circuit with a 25,000 ohm resistor in place of the 250,000 ohm unit used in some sets.—Ray Chandler, Delake, Ore.

Bosch 440C. Erratic and weak reception after set plays a few minutes. The lug on the L. F. broadcast oscillator padder condenser C39, is arranged in such a way as to short out the condenser very easily.—A. B. Chismar, Streator, Ill.

Clarion Jr. A tone control and built-in antenna may be added to this receiver with very little difficulty. The control consists of a 50,000 ohm variable resistor and a 0.1, 600 volt condenser. The 0.1 condenser is connected from the plate of the 47 to ground with the variable resistor in series with the grounded side of the condenser.

The built-in antenna consists of two 0.1, 200 volt condensers connected to either side of the 110 volt line. One of the condensers is directly grounded while the other one is connected to the antenna post on the antenna coil.—Stoddard Radio Lab., Oak Park, Ill.

Clarion 80, 81. Models AC 80 and 81 Clarion Receivers manufactured by Transformer Corporation of America may have a-v-c added by replacing the type 24A second Detector tube with a type 2A6. This necessitates changing the socket for this stage from a five to a six prong socket and making the following circuit alterations. Connect the diodes of the type 2A6 together and connect to the former grid terminal of the second i-f transformer. Replace the tone control and on-off switch with a .5 megohm potentiometer having an on-off switch. The potentiometer to be used as the diode coil return to the 2A6 cathode, and supply for a-v-c voltage. The control grid of the Type 2A6 should go direct to ground through a .5 megohm resistor and is coupled to the variable arm of the new volume control potentiometer through a .02 condenser. An additional 150,000 ohm resistor should be added to the plate load of the 2A6. The 40,000 ohm bias resistor of the original 24A tube should be replaced with a 3,000 ohm resistor.

To complete the a-v-c circuit the grid inductances of the r-f and first detector stages must be removed from ground. This necessitates

the removal of both these coils from the chassis as they are grounded within the shield cans. A 1 megohm resistor is connected from the high side of the new volume control potentiometer to the low side of the first detector grid coil. This point is bypassed to ground through a .01 condenser, and is also connected to the low side of the r-f coil through a .1 megohm resistor where a .005 condenser may be used as a bypass. The 230 ohm bias resistor is disconnected from the variable arm of the old volume control and connected directly to ground. The old volume control is now connected from ground to the .02 condenser which is connected to the plate circuit of the type 47 output tube and serves as the new tone control. The installation of this circuit prevents fading on weak signals and overloading on very strong signals.—E. E. Overmier.

Clarion 240 (All Wave). Low volume may be due to an open bypass condenser inside the i-f can located at the right rear of the set looking from the back. Replace with a .05 mfd. tubular condenser. It is necessary, when aligning these models, to make certain the bottom chassis plate is in place and making good connection to the chassis proper, otherwise the alignment will change when the receiver is bolted in the cabinet.—D. A. Brown, Marion, Ohio.

Clarion 470. If all parts check O. K. but choppy reception, distortion and low sensitivity persists, change the 2A6 tube bias resistor to 5000 ohms. The original value was 10,000 ohms.—A. H. Kohnert, Millbrook, N. Y.

Colonial 62. Operation failure in this model may be due to the type 56 oscillator tube not oscillating. If replacing the tube has no results, check the grid resistor and grid condenser of this tube and if values have changed replace the proper units, (value 30,000 ohms—.00025 mfd.). If this is not the trouble or if the set still lacks tone quality, and the power output is distorted, check the 8 mfd. input condenser going to speaker field as this often shows leakage.—Geo. F. Baptiste, Howard, R. I.

Coronado 575. If the complaint is fading look for a poor ground on the battery switch. The ground is obtained through a wire running from the switch to one of the i-f can lugs. This has a habit of working loose. The switch is usually OK, but if in doubt ground the shaft with a pigtail.—Vere L. Henning, Montevideo, Minn.

Courier 65. The volume of this set can be increased 25 per cent by removing the cathode resistor ahead of the variable resistor used

as a volume control. A smaller resistor can be put in its place. The volume control should be replaced with a tapering type to reduce the critical adjustments in varying volume.—Walter Gazowsky, Detroit, Mich.

Courier 65. When this set oscillates and all remedies fail try a 0.1 mfd. condenser from contact of volume control (opposite the contact ground) to ground on chassis. This will remedy the trouble. —Clarence Bierkamp, Jr., Youngstown, Ohio.

Crosley 143. Symptoms:—Poor control of volume and also extremely difficult to tune in stations at the high frequency end of the dial. Replace the 300,000 ohm second detector 34 tube plate load resistor with one of 250,000 ohms. Improved punch and better control of volume can be obtained by changing the negative 22½ volt lead to the minus 16½ volt tap on the "C" battery. This will increase "B" drain only slightly. The 2.0 mfd. condenser across the "B" supply usually develops leakage so be sure to replace. Improved tone can be had by replacing the Class "B" input transformer.—N. E. Nelson, Mayville, N. D.

Crosley 148. In many of these radios the first i-f plate trimmer will short, killing all "B" voltages and acting like a shorted filter condenser. The short usually occurs next to the ground plate of the trimmer, several plates being in the trimmer. Re-insulate with larger pieces of mica.—Barrett Radio Service, Sulphur Springs, Texas.

Crosley 148 (Fiver). Elimination of modulation hum, increased volume and improved tone may be obtained in these models by merely adding a .02 mfd., 600 volt condenser from the low side of the a-c switch to the chassis. N. E. Nelson, Mayville, N. D.

Crosley 148, 167, 169. When these radios come in with a complaint of no reception and a steady low pitched shrill whistle, replace the dual condensers .03, .006, serving as coupling condenser and detector plate bypass. This trouble is very hard to locate as it sometimes takes days and even weeks to act up, and when it does start to whistle the slightest electrical disturbance in testing restores normal operation.—Fred B. Honchock, Monessen, Pa.

Crosley 163. Bad distortion after the set warms up with all resistors okey and the filter condensers perfect, can be cured by making the following change: Replace the 150,000 ohm resistor in

the cathode circuit of the 77 tube with a 100,000 ohm unit and the set will be okey.—N. E. Nelson, Mayville, N. D.

Crosley 168. Loud 60 cycle hum on strong stations. To remedy, it is necessary to install an 0.1 mfd. condenser between one side of the a-c line and chassis.– Paul Grayson, Gastonia, N. C.

Crosley 636. A complaint of intermittent oscillation, squeals and howls was very difficult to locate. The trouble was eliminated by the replacement of the class "B" input transformer part No. 24628, a unit we did not suspect. We found this trouble in several of these models. Joseph S. Napora, Uniontown, Pa.

Crosley 716. A complaint of no reception or of excessive noise, is often caused by an open or intermittent oscillator plate resistor. This resistor is wire wound and is a frequent offender. Replacement should be made with a high grade carbon resistor of reputable make. —Joseph S. Napora, Uniontown, Pa.

Crosley 816. In this receiver and other Crosley models using the special sound diffuser baffle, a complaint of rattles is often traced to loose sections of the ply wood of which the baffle is made. Take the speaker off the baffle board and recement any particles of the plywood. Joseph S. Napora, Uniontown, Pa.

Delco 1936-37 Home Sets. When these sets have been in use for some time they may develop loud crackles and roars. You will likely find that the wave band switch when turned from one band to another has quite a bit of mechanical movement that causes the socket of the 6C5 tube, located to the right and next to the dial, to become internally shorted. Replace the socket, but be sure to solder a small piece of flexible wire from the external connection to the part which makes contact with the tube prong. We have had several of the above cases in our shop and have found that the grid prong always shorts first.– Red's Radio Shop, Birmingham, Mich.

Delco 628. When this set will not bring in weak signals, make sure that the receiver is in normal operating condition and make the following change: Locate a black lead protruding from the bottom of the second i-f coil. This lead connects to the inside end-lug of the five lug terminal strip located on the side of the vibrator shield partition. Disconnect this lead from the terminal strip and connect it directly to the 85 tube cathode. This will improve reception in

remote districts, but will give very noisy reception if used in cities where local interference is bad.—Orvil W. Carter, Coffeyville, Kans

Delco 3201, 3202—32 Volt Radios. These sets often motorboat between stations although they are properly balanced. The trouble is that the line voltage is too high. Install an automatic voltage control tube to keep the voltage at 32 volts. This set draws 1.5 ampere at 32 volts.—John L. Freling, Hannibal, Mo.

Detrola 5-B. For very choppy tone starting about 10 minutes after the set is turned on, look for an open section of the candohm resistor located on the right of the ground connections on the candohm. Replace with a 100 ohm, 5 watt resistor. The value is very critical. This trouble is hard to locate because of the parallel circuit.—Al's Radio Service, Tonawanda, N. Y.

Detrola 6-W. The resistors used in this model tend to increase in value after a period of time. On cases where the set is weak, particularly check the 7500 ohm plate resistor in the i-f stage. If the trouble is distortion, check for shorted or leaky 25 mfd. electrolytic across 42 bias section of candohm bleeder.—F. Reisdorf, Detroit, Mich.

Emerson H-5. Bad hum when the condensers and tubes check perfect, may be due to the following. If the line ballast is the type where the resistance element is clamped in a metal holder with asbestos as an insulator between the two, place the set in operation and check for a-c leakage from any tap on the ballast to chassis. If an indication is present insulate the ballast from the chassis or replace same.—A. H. Urbansky, Newark, N. J.

Emerson U6D. A common complaint from this receiver is frequency drift necessitating constant retuning in order to hold any certain station on the broadcast range. On the short wave range this trouble is not so noticeable. The peculiar problem is that when this receiver is removed from the cabinet, all signs of drift or frequency change disappears. The trouble will be found in a small midget type compensating condenser in series with the broadcast oscillator coil. This condenser being of a composition fibre and mica construction will not hold calibration with changes in temperature. There are two possible remedies—one is to replace the condenser with a small air tuned walnut type. However, a much simpler method is to control the temperature change in the receiver by

providing ventilation. This can be done by drilling several 5/8 inch holes in the cabinet base in the vicinity of the compensating condenser, making sure that one of the holes falls directly opposite the condenser. This not only provides ventilation but also makes the condenser accessible for adjustment without removing the chassis from the cabinet. The above procedure completely eliminates drift and frequency change, and also improves reception greatly since poor ventilation also has a tendency to throw the i-f transformers out of line. The above trouble does not manifest itself on the S. W. band due to the fact that the compensating condenser controlling the oscillator coil for S. W. is in parallel and therefore not as critical. C. C. Richelieu, Milwaukee, Wis.

Emerson 103. A loud pitched whistle which is much stronger than any station can be cured by using a lower value resistor in the grid of the 33. Use the highest value that will stop the noise. Daniels Bros., Everett, Pa.

Emerson L135 or 2 MN Series. When these sets come in dead and all voltages are normal, look for corrosion in the oscillator coil primary. A continuity test will show the coil to be ok. Many of these coils absorb moisture in damp climates, particularly in the Gulf States Area. The corrosion is sometimes barely noticeable. It is best to replace the coil as repairing of the wire is difficult.—Barrett Radio Service, Sulphur Springs, Texas.

Erla-Sentinel 60BT. In several of these radios, I have found the following trouble: The volume is very low on all stations, although all voltages test all right. I have found this trouble to be caused by a partial short in the volume control. The center terminal tests about 500 ohms to ground. Sometimes the short disappears during the testing process, but it is safer to replace the volume control anyway. This is the first thing to look for in this and similar models. —Robert Smith, Olds, Iowa.

Erla 6200, 7700. To stop oscillation in these models, replace the .01 mfd. condenser, used to bypass the grid return, with an .02 mfd. on the i-f transformer. To improve the tone quality and eliminate background noise in the Model 6200, install a 10,000 ohm resistor in series with a .005 mfd. condenser from plate to ground on the last audio tube. —Geo. A Lewis, Storm Lake, Iowa.

Fada K. U. This set uses a system of screen bleeder and cathode variation for a volume control giving poor control at low volume. To remedy this proceed as follows: Remove old volume control, installing new 15,000 ohm control with taper for antenna and cathode bias. Ground center arm of new control, left arm goes to antenna post, right arm goes to cathode bias resistor, then ground old wire leading from screen series resistor through 5,000 to 8,000 ohm, 2 watt resistor. This completes the job and the volume control is now smoother. This can be used on other sets using the same method of volume controlling.—Al's Radio Service, Tonawanda, N. Y.

Fairbanks Morse 8AT8, 8AC2, 8AC3. When these sets are normal on police and foreign stations, but completely dead on standard broadcast, look at the resistor mounted directly on the 6C5G oscillator socket and connected to terminals #1 and #5. Unless the resistor is open the application of a hot iron to the joints will cause normal reception. We have had several of these sets with exactly the same trouble.—Bernard Greene, Petersburg, Va.

Fairbanks Morse 42 Series. If you are having trouble keeping "B" and "C" batteries on this receiver, trace out and remove entirely from the set, the 20,000 ohm $\frac{1}{4}$ watt resistor that goes from minus 16$\frac{1}{2}$ volts C direct to ground. We have found this on several of these sets and have noticed no drop in the performance of the set, but have increased our battery life more than 100% in most cases.

Explanation: The switch in this set is on the negative lead, A, B and C plus and as this resistor is from C minus 16$\frac{1}{2}$ volts to ground, there is a direct lead from "B" through to the "C" battery through the 20,000 ohm resistor to ground even though the switch is open, and as the "B" minus circuit is returned to ground through a filter condenser and a high resistance resistor circuit, the circuit is therefore complete enough to allow from 1 Ma. to 2$\frac{1}{2}$ Ma. of "B" and "C" current to drain at all times which will shorten the life of the "B" and "C" batteries considerably. Before we started to remove this resistor our batteries were only lasting a few days for the Eveready No. 772, to a few weeks for the Eveready No. 486's. We now actually get months of operation from the No. 772 "B" batteries.—O. M. Haire, Hagerstown, Md.

Fairbanks Morse 42T5-B. Steady drain on B's when set is turned off. The drain is as high as 1$\frac{1}{2}$ mills. For satisfactory service, remove the 20,000 ohm resistor from minus 16$\frac{1}{2}$ C to ground. —Harold Gillogly, Bonners Ferry, Idaho.

Freshman 400. A type 56 with the grid tied to the plate is used as a rectifier. The grid of this tube often shorts to the cathode thus shorting the transformer. This fault can be remedied by replacing the 56 with a Sylvania 84. The filament terminals are disconnected from the 2.5 volt supply and are connected in parallel to the 6 volt supply of the 41 output. The two plates of the 84 should be connected together at the socket.—Stanley Baronowski, Bayonne, N. J.

Gable 1937. If you have a call on a Gable '37 job and you find it dead with an unusual blue glow in the 83—don't dive for the filters. Examine the wire on the low side of the choke. You no doubt will find that the insulation has broken down and the wire is shorting to ground. Clip the wire and run it through a piece of spaghetti, resolder and the job is OK. We have serviced several of these machines for the same trouble.—B. Greene, Petersburg, Va.

General Electric Pilot Light Failures. A cure for pilot lights burning out in 1937 G. E. with colorama lights is the placing of a 150 ohm resistor in the center tap of the high voltage winding. Also a 15 ohm resistor should be used with the colored lamps. This will offset high line voltages.—Alvin Morgan, Somerset, Ky.

General Electric A-64, A-67. Distortion may be cleared by raising the 6J7 audio plate voltage to 78 volts. The plate dropping resistor often increases in value from its original 500,000 ohms, thus reducing the voltage.—F. W. Johnston, Gainesville, Fla.

General Electric A-82, A-86, A-87. Failure on any particular band may frequently be traced to a shorted permaliner trimmer condenser. The permaliners are located in the Sentry Box, thus it is necessary to remove one of the shield cans. This may be done by removing the dial cylinder and band-change-switch assembly and sliding the switch shaft out the front. With the switch shaft removed all parts are easily accessible.—F. W. Johnston, Gainesville, Fla.

General Electric A-86. In this receiver and others with the Sentry Box assembly, it is a complicated job to remove the Sentry Box shield cans to get at the source of trouble when located in that unit. After I have the Sentry Box cans off for the first time, I cut a slot from the wave band switch hole to the edge of the can so that on future jobs on the same set, it will be possible to remove the cans without touching the dial assembly. This saves considerable time on

any subsequent servicing of that set. —Oscar Carlson, Seaside Park, N. J.

General Electric C-41. On this model a short between the open end of the i-f trimmer and the primary soldering lug will ruin the 6B7 tube. This occurs when the set warms up just enough to cause this trimmer plate to warp over and touch any solder that has run down the lug on the trimmer side. Remove the solder in the trimmer side and replace the tube with a new Sylvania 6B7.—Geo. Baer, Roslindale, Mass.

General Electric E-91, E-95, E-101, E-105, E-106. Failure of the Colorama Dial to change or sluggish changing may be traced to a defective 0.5 mfd. condenser across the high resistance side of the Colorama reactor, part #RC156 schematic part C52. Colorama changing may also be pepped up by replacing the Colorama tube with a Sylvania tube of the same type.—F. W. Johnston, Gainesville, Fla.

General Electric F-63. When the antenna coil in this receiver burns up, don't suspect the set of having been struck with lightning. The wave band switch, in which the rotation stop arm becomes defective, will rotate beyond its proper point and place 98 volts on the antenna winding, subsequently burning it out.—A. B. Chismar, Streator, Ill.

General Electric J-100, J-105, J-107, J-109. Each of these sets use a type 82 mercury vapor rectifier which radiates noise on weak signals. This 82 tube may be changed to a Sylvania 5Z3 rectifier by the following directions: The power transformer on this set has a separate 2.5 volt winding for the 56 a-v-c tube. Disconnect this from the a-v-c tube and connect in series with the rectifier winding, thus giving the necessary 5 volts for the 5Z3 tube. Next connect the a-v-c heaters to the winding supplying the other 2.5 volt tubes. The wire connecting the a-v-c heater to the cathode should be removed.—Al's Radio Service, Tonawanda, N. Y.

General Electric J-125. Intermittent, erratic reception and oscillation or motorboating between stations is often caused by dirty wiping contacts on the variable condensers. Cleaning these usually remedies this situation.—George Springmeier, Jr., Cincinnati, Ohio.

General Electric K-51. When all voltages test all right and the

set has low volume the trouble is usually a defective series padding condenser in the 2A7 circuit. The oscillator and i-f adjustment and the series padding condenser should be checked carefully.—Geo. F. Baptiste, Howard, R. I.

General Electric K-62, RCA R-11. To cure motorboating connect an 0.1 mfd. condenser across the resistor mounted inside the antenna coil.—Roy E. Busse, Mankato, Minn.

General Electric M-51. A fading hard to find is often caused by the coupling condenser from the plate of the 6B7 to the grid of the 42 opening up. Replace with a .01 mfd., 600 volt unit.—Al's Radio Service, Tonawanda, N. Y.

General Motors A. Models with serial numbers below 62100A have a metal encased 0.1 mfd. condenser across the first choke coil in the filter supply. Hum will result if this condenser shorts. This condenser is under five connection terminal strips in the rear left hand corner when the set is turned bottom side up. Models with serial numbers above 62100A do not use this condenser and it does not seem to make any noticeable difference when not used.—Clifton S. Krumling, Spencer, Iowa.

General Motors 120, 130, 140. Several cases of intermittent reception were caused by the condenser which by-passes the cathode voltage on the first r-f tube. I replace this condenser with a tubular unit and have no more trouble. While I have the sets in for repair I solder a pigtail from the condenser rotor to ground to suppress oscillation on the high frequencies.—Harold B. Cook, Wichita, Kans.

General Motors 251. To prevent cross-modulation from very strong nearby stations, install a shielded lead from the antenna post to the antenna coil. Also switch the lead from the antenna coil to the lug next to the coil, and use the old antenna coil lug for connecting the oscillator condenser.—Anderson Radio Hospital, Seattle, Wash.

Gloritone 26. Better all around performance of this set can be had by removing the black bypass condenser that goes from the r-f assembly to ground on back of chassis. This will result in better quality and an increase in frequency range.—David Williams, Peabody, Mass.

Gloritone or Carlton 27 Chassis. To increase sensitivity and volume on these models, remove the wire on the shunt resistor from the terminal next to the B plus at the right hand end, resolder to extreme end. This will increase plate voltages and will result in pick-up on volume. In all high gain receivers employing cathode bias volume control, you can try connecting a 1 to 4 mfd. condenser from cathode to ground to end oscillation.—Geo. Baer, Roslindale, Mass.

Gloritone 27. The simplest way to squelch inductive hum originating in the audio section is to insert a resistance of about one-half megohm between the grid of the power tube and ground. Too high a value will have no effect; too low a value will stop the hum but will also impair tone. Don't connect the resistor across the audio transformer secondary. When it becomes necessary to replace the power tube bias resistor in this model, use one with a 20-watt rating as this resistor carries the total output of the power supply.—B. E. Wenstrom, Ashtabula, Ohio.

Graybar 100. When this set has poor or no reception with the type 27 a-v-c tube in the socket, but good reception when the tube is removed, check the cathode by-pass condenser. The heater and cathode of the a-v-c tube are tied together and by-passed to the grid. An 0.5 mfd. condenser will work very nicely.—Geo. Baer, Roslindale, Mass.

Grunow Super Teledial (Any Model). When this set cuts off and the trouble cannot be located, slip off the dial and check the reeds on the station stop. Careful inspection of the reeds and moving them with an insulated rod will show up the trouble as defective mica spacers. Replace with new spacers.—Francis J. Kmetz, Allentown, Pa.

Grunow 12W. The 0.1 mfd. condenser from B plus on the third i-f transformer to ground gives quite a lot of trouble in these sets. It often shorts and burns up the 2200 ohm dropping resistor in series with the second i-f tube plate circuit. It is a good practice when working on these sets to replace this condenser whether it is shorted or not.—D. H. Prewitt, Artesia, Calif.

Grunow 622. Audio distortion is usually caused by lack of grid bias on 42 output tube with plate current of about 65 milliamperes. All resistor and condenser values correct. Insert a 400 ohm, five

or ten watt resistor between the black wire from the speaker field coil and the negative end of the wire wound C resistor increasing the bias to proper value.—R. L. Bonsteel, Asheville, N. Y.

Grunow 660 Chassis 6C. A frequent trouble in this receiver is mushy reception. The set will pick up stations but the reception will be distorted. We have found in every case of this kind that the .01 coupling condenser between the plate of the 75 tube and the grid of the 42 was leaky. Even if this condenser has a leakage of from 5 to 10 megohms, it will cause trouble. This unit is part No. 29453, mounted on the inside and at the bottom of the small terminal board which is on the left side of the chassis looking at the set bottom side up from the front. Replace with a 600 volt type and you won't have any call backs. Be sure to disconnect one end of this condenser to test for leakage.—J. S. Kreutz, Ansonia, Conn.

Grunow 750, 751, 752. No reception in these models on part of band "C" from about 2000 to 1500 kc., even though set checks OK and is otherwise normal, is due to the oscillator refusing to function over that portion of the band. Remove 50,000 ohm oscillator grid resistor (Part #2385.3) and replace with a higher value; about 150,000 ohms seems satisfactory.—Anthony Piatti, Northville, Mich.

Grunow 1067 (Teledial). If this set cuts off, check the mica bodied resistor connected from the 6F6 tubes to ground as it often opens. If shorted, the set will motorboat on strong locals at normal gain. The value of this unit being very critical makes it best to use a resistance indicator to obtain good overall sensitivity.—Francis J. Kmetz, Allentown, Pa.

Grunow (1937). A peculiar hum which develops on some of the Grunow 15 tube models after the set has played a few minutes can be eliminated by connecting the shell of the large speaker to ground. —Oliver F. Klein, Milwaukee, Wisc.

International Kadette. Hissing and intermittent oscillation at the high frequency end of the dial can usually be overcome by cleaning the condenser plates and adjusting the trimmers. If noises are present, either replace KR-1 rectifier with a Sylvania type 1V or place a small r-f choke between cathode of rectifier and the filter choke. This choke will filter out the disturbances which are so common with mercury-vapor rectifiers. The type 1V is a vacuum

type rectifier and does not cause such disturbances.—Henry Burlingame, Abington, Pa.

International Kadette. A common trouble with these sets is due to the line dropping resistor becoming quite hot and causing disintegration of the parts. The failure is usually that of the dual 0.5, 0.5 mfd. bypass condenser to the cathodes of the 36 and 38 tubes. Remove the line dropping resistor from the set and replace with a 290 ohm line resistor cord.—William R. Benedt, Chicago, Ill.

Kennedy 62D. When the tuning meter is jumpy, accompanied by erratic action of the set, the trouble may be traced to intermittent opening of the 4200 ohm section of the Candohm voltage divider. This will check okey with the switch off.—Clarence M. Doyle, Utica, N. Y.

Kolster 110, 120, 130, 140. Perfect alignment of these models is usually difficult because the tuning condensers are enclosed in a shield that cannot be taken off. Often the condenser plates need altering and the only way to do this is to take a screw driver and a pair of pliers, bending the fore part of the shield out and upward. At first it looks as if you are tearing the set up, but it's really easy to put back when once torn apart. Altering the plates and adjustment of the trimmers will give a perfect balance job.—Harold B. Cook, Wichita, Kans.

Lafayette 24. If the signal detunes when the automatic frequency control is turned on, readjust the discriminator transformer which controls this action. A low range (0-5V or 0-10V) high resistance voltmeter or preferably a microammeter is inserted in series with the diode load resistor at the grounded end, which will indicate maximum when a signal is tuned to exact resonance. The 0.5 megohm load resistor is located directly under the discriminator transformer. A 0-10 milliammeter is inserted in the cathode circuit of the a-f-c tube. An r-f signal (any frequency in the broadcast band) is fed into the receiver and is tuned as accurately as possible (with a-f-c off). Now throw the secondary trimmer of the discriminator off resonance. Tune by the meter maximum output of the primary side. Turn a-f-c on and tune secondary in the same manner. Then turn a-f-c switch on and off, there should be no meter deflection.—Herbert Hass, Chicago, Ill.

L'Tatro 6-Volt Farm Radio H465-I465. The early sets of these models go dead with no apparent reason; voltages test normal; vibrator sounds all right and the tubes light. Holding the aerial wire on the cap of the Type 15 oscillator tube generally brings in stations. The reason for this is that the oscillator tube does not oscillate properly. A sure cure is to replace the 5000 ohm resistor, shunted across the .0015 condenser from the cathode of the 15 oscillator tube to center tap of the oscillator coil. Replace the resistor with one of about 3800 ohms resistance. These parts will be found on the end of the radio where the aerial wire enters. In the later models of this set, the resistor was changed at the factory.—Raymond Feldman, Little Rock, Iowa.

L'Tatro K54, M54, NH44, (32 V.). Lack of volume and poor quality in these models, providing the 45 volt "B" battery is good, is generally due to lost capacity in the 10 mfd. 25 volt electrolytic condenser in the 75 tube cathode circuit.

Incidentally, these sets can be stepped up in volume considerably by merely removing the dial lamp. No danger to the tubes, in so doing, unless the 32 volt supply runs well up above 35 volts most of the time.—N. E. Nelson, Mayville, N. D.

L'Tatro UP36, ZP36 (32 V.). Very weak reception which is isolated to the 75 tube grid circuit may be a short across the ground and center tap terminals (center tap goes to 75 grid). The trouble is that the 75 grid lead is grounded to the shield. This trouble may eventually develop in many of these models due to the thin insulation between the wire and the shield.—N. E. Nelson, Mayville, N. D.

Lyric LA-6. Symptoms:—Intermittent reception, crackling noises, or set completely dead. The 80 rectifier tube is usually damaged. A continuity check does not reveal the trouble. The trouble lies in the speaker field insulation breaking down and shorting to the speaker frame which is grounded. If the coil is not extensively damaged, a permanent repair may be effected by insulating same, and reassembling the speaker. Install a new Sylvania type 80 as the rectifier is probably weakened or otherwise damaged due to the load on it.—Al Kiszewski, Milwaukee, Wisc.

Majestic Receivers. In the Majestic receivers that use spray-shield tubes, I had oscillation trouble that was difficult to locate. This was usually of an intermittent nature. The oscillation was found to be due to the spray-shield not making contact with the

cathode pin. The wire connected from the pin to the shield was broken or was not making good contact on the shield. The cure is to replace with a Sylvania shielded tube of the same type number. The 6F7S usually causes the trouble.—F. Sikonski, Pawtucket, R. I

Majestic 15. Failure to operate below 800 Kc. can be overcome by changing the autodyne 24A cathode bias resistor to 8000 ohms. To improve, change the autodyne 24A to a 57 tube using a 7,500 ohm bias resistor.—Bill Estick, Norwich, Kans.

Majestic 20. The oscillator 0.1 megohm grid resistor that usually opens can be replaced without removing the bottom cover and unsoldering wires. Remove the horseshoe washer from the shaft and take off the dial. The resistor can be reached by using long nose pliers. Carefully grip the resistor with pliers and raise it up causing the pigtail lead to unwind from the resistor. Solder a new resistor lead to the old pigtail and ground the other side of the resistor to the most convenient place on the chassis. By removing the right end plate (facing front of the set) the old resistor can be cut from the chassis with diagonal cutters. This will save considerable time.—E. Bintliff, Riverside Park, N. J.

Majestic 50. This set would play for a while then click and the volume would drop so that the set could hardly be heard. All voltages checked normal, and turning on or off electric lights or appliances did not affect operation. The trouble was found to be a defective .04 mfd. condenser between the center tap of the oscillator coil and cathode of the type 24A first detector tube. Replacing this part solves the problem.—G. F. Kinkade, Elk Mills, Md.

Majestic 66. Choked and distorted signals with weak reception may be caused by an open 10 mfd. condenser in cathode circuit of the 6C7. This is condenser #C12 in Rider's Manual.—Tim W. Shaw, Vernon, Texas.

Majestic 70. This set came in with low volume and distorted reproduction. All voltages were considerably below normal. I dismantled the power supply and could find nothing wrong. Finally afters hours of work, I discovered that the leads to the pilot lamp pass through a metal sheath on the end of the gang condenser and that too much strain on the shield had caused the sharp metal edge to short out one side of the pilot lamp lead. I taped the wire at this point and all voltages jumped back to normal and the set played 100%.—Edwin Levinson, Perth Amboy, N. J.

Majestic 95, 105 (2 V. Sets.). Symptoms:—Lack of volume and poor tone. To remedy be sure to replace the 1B5-25S grid coupling condenser (2 blue leads from metal can #11245) with a .02 mfd., 600 volt unit. Both these condensers are usually very leaky. Generally too, the unit with a white rubber lead from the condenser can to the r-f coil can will be found leaky. Replace it with a .05 mfd., 600 volt unit and ground to can. Bad oscillation from 550 Kc to 650 Kc can be eliminated by increasing this unit to a 0.25 or 0.5 mfd., 600 volt unit.

Added pep can be had by replacing the 1A6 with a Sylvania 1C6. Be sure to realign all circuits after doing this. When using a 2 volt "A" battery the Candohm resistor section in series with negative blue lead and filament of 34 r-f tube should be shorted out or poor volume may result. —N.E. Nelson, Mayville, N. D.

Majestic Chassis 300. Low volume and volume controlled on about 1/5 of the manual volume control. This action is not due to any defective part in the set, but is due to the 57 tube located directly above the manual volume control. Replace this tube with a shielded Sylvania 57S or 58S tube. Preferably type 58S, as it gives smoother volume control action to this particular chassis.—John H. Bloomer, Philadelphia, Pa.

Majestic 310-B. This hint applies to all sets using i-f plate feed for automatic volume control. A very slight leakage will bias the controlled grids positive, causing them to block, killing reception. Some cases are so slight as to require a vacuum tube voltmeter to detect. Replace defective unit with 50 to 100 micromicrofarad mica condenser.—Harl O. Piety, Georgetown, Texas.

Majestic 330. This model uses a type 59B output tube which is not made by Sylvania. Change to a 2A5 Sylvania tube by taking out the 7 prong socket and replacing with a 6 prong socket. Rewire the new socket by fastening the original lead wires to the respective terminals with the suppressor grid lead to the cathode terminal.—Clive W. Keemer, Dayton, Ohio.

Majestic 800, 850. The Model 800 receiver is of the AC-DC design with traveling pilot lights which often short to chassis, burning out all three pilots and often damaging the #A-16037 ballast tube. Always check the pilot and traveling light circuit when the pilots and ballast need replacement. The flexible in-door insulated antenna wire may be used for re-wiring the traveling pilot light.

The heater wires leading to the traveling light assembly in the Model 850 are a frequent source of trouble, in that the insulation wears causing the wires to short to the chassis, opening the dial light circuit. For a permanent repair use a high grade flexible wire as outlined above.—J. S. Napora, Uniontown, Pa.

Majestic 850 (1937). The Hi-fidelity switch is a frequent offender in this model. Very low sensitivity results. Use a good S.P.D.T. rotary switch as a replacement.—Joseph S. Napora, Uniontown, Pa.

Midwest 18-36. This and other models employing a large size bell shaped speaker cone, instead of the regulation shaped cone, develop a very annoying buzz on the deep bass notes. This is due to fatigue of the cone and voice coil form. Re-centering and re-shaping of the voice coil will not cure the trouble, due to the fact that the heavy downward pull of the voice coil on the deep bass tones causes the bell shaped part of the cone around the voice coil to be drawn out of shape. This in turn also causes the voice coil to momentarily lose its trueness resulting in the latter rubbing against the center magnet (on the inside) and outer centering hole. This defect can only be detected by removing field coil and housing and observing how bad the voice coil sags when the cone is pressed downward.

To effect a permanent cure first make sure that the voice coil is properly centered. Then, having the correct speaker shims in place between the voice coil and center magnet, apply several coats of speaker cement to the cone, front and rear for about 2 or 4 inches starting at the voice coil, allowing each application to dry thoroughly with shims in place.—Fred B. Honchock, Monessen, Pa.

Midwest 1938 20 Tube Models. The dial lamp and bull's eye wiring becomes worn or broken very easily, causing cut-outs and grounds. Replace completely with a D.C.C. stranded wire for greater strength.—Lester H. Davison, Alameda, Calif.

Norco 160. These receivers in the 71000 series often develop faulty volume controls. The volume control has too much carbon on the high end and as this wears it deposits on the moving contact causing a 1000 ohm loop to ground. This causes the set to operate at extremely low volume although all voltages check ok. To remedy, use a new .5 megohm control or take the old one apart, clean it and then shellac the carbon. The new control is the best bet. Walter T. Walsh, San Francisco, Calif.

Norco 160, Remler 45, 60, 71. It is not an easy job to take the volume controls of these sets apart and put them back without causing damage. If shellac is applied improperly, it may seal some almost invisible granules which would cause permanent injury to the volume control. I suggest these two easy methods to remedy the fault. 1. Blow air through the small holes behind the connecting lugs which will cure the fault permanently. 2. Charge a 4 mfd. paper condenser from the filter section of any set and discharge it through the volume control. This will burn the fine loose carbon granules in the faulty volume control without damage, as the time of discharge is only a fraction of a second. However, no direct current should be sent through the volume control as it will burn the carbon paper immediately.—M. Margossian, Oakland, Calif.

Philco (All Models). It is the practice of some servicemen to bridge across an open condenser with a new unit leaving the original in the circuit. This practice affords the serviceman a convenient mounting, but this is a poor practice. An open condenser may function abnormally at times, causing a "plop" to come in the set with a loss of volume. Always remove the defective units. This hint also applies to other receivers.—E. B. DeWell, Petersburg, Va.

Philco Receivers. A simple service tool which I call a "jiggler" really speeds up the checking of the bakelite condensers causing intermittent trouble in Philco receivers. It can be made easily from an ordinary straight pin with the head clipped off and a small wooden handle. Insert the blunt end of the pin into one end of the handle and fasten securely.

To use the jiggler, insert the sharp end into the openings in these bakelite units through which the lead wires enter the condenser and "jiggle" it around. The intermittent contact in the condenser is almost always where the lead joins the condenser inside. With the jiggler, you can cause the condenser to open, determining which unit is causing the trouble.

The above method will not apply to Philco receivers of the last two years or so as the holes are filled with solder to keep out moisture and thus prevent this trouble.—S. W. Ferrell, Jr., Greenville, Ala.

Philco 12-X. If distorted reproduction in the form of a high pitched whistle is encountered in this set, remove the twisted leads running from speaker plug socket to plates of output tubes and make them as short as possible. This can be done by connecting the leads

in as direct a line as possible and not in the path originally used. Keep the leads free from the third r-f primary compensating condenser or a slight hiss will be heard.—R. L. Foster, Sciotoville, Ohio.

Philco 20. When oscillation starts on this set, instead of bypassing the 71 bias to ground as has been suggested, use a small unit of .05 to 0.1 mfd. and connect across the entire voltage divider (from 45 to plus 135) and the same results will be obtained without the hum.

Of course, this same applies to all sets where it is desirable to bypass the output bias resistor—less oscillation and a notable improvement in tone generally results.—C. O. Barnhart, Walhalla, Mich.

Philco 37-610. No short wave reception may be due to the small condenser (mica) soldered to tuning condenser being loose. Resolder and bend to clear plates of the variable condenser.—Wm. Hickey, South Norwalk, Conn.

Philco 38. Distortion on low volume only may be overcome by changing the 32 second detector tube even though it tests good. The 1A6 det. osc. used in some of these models may be replaced with a 1C6 for better oscillator performance. The set should be realigned. The correct volume control replacement is very important. Two different controls are used on these models. Part No. 33-5017 is used on the early 38 and part No. 33-5154 is used on the 38 code 123. —Joseph S. Napora, Uniontown, Pa.

Philco Model 38-7. To reduce extreme bass response in these models change the following parts:—Remove condenser No. 24, .01 mfd., replace with condenser .001 mfd. Remove resistor No. 32, 51,000 ohms ½ watt. Replace with 40,000 ohm ½ watt resistor. Remove condenser No. 35, .006 mfd., replace with condenser .01 mfd. This change results in better all-round response.—M. J. Planovsky, Cleveland, Ohio.

Philco 38-116 Code 125 and 38-690. To prevent parasitic oscillations and improve performance of the oscillator circuit at 180 Mc. in Model 38-116 Code 125, connect a 100 ohm resistor between the 6A8G oscillator anode and the 6N7G plate. This resistor replaces the original brown wire which should be removed.

To prevent oscillation and improve performance at 118 Mc. in Model 38-690, use same procedure as given for Model 38-116 Code 125.—M. J. Planovsky, Cleveland, Ohio.

Philco 59. When you find it necessary to replace the dial gearing on this model, which generally requires the removal of the old tension spring cup and ball bearings; drill a ¼ inch hole directly above the screw that holds this unit in place. This screw is at once accessible and the rest of the work—removing and replacing of old parts—is then a matter of a few minutes work and the set is then ready for further service of the same kind at any future time.—Berlin Radio Service, Buffalo, N. Y.

Philco 60. When any of these sets come in with an intermittent a-c hum that ruins reception, look at the condenser from the last filter to ground. This is a small paper condenser about .25 mfd. in capacity and housed in a tin container with several other by-pass condensers.—J. E. Lephart, Arcanum, Ohio.

Philco 65. When you service this model, check the plate voltage of the 45's. If the voltage is approximately 100 to 115 volts, reverse leads listed as C and D in the manuals. This will bring the plate voltage up to normal and your customer will say it works better than when new.—M. W. Vavrek, Cleveland, Ohio.

Philco 70. If this set fades on low volume, the chances are that the coupling condensers need replacing. Sometimes resoldering the connections will repair it for awhile. When this set gives a hum on stations tuned in at about the middle of the dial, look for trouble in the double condenser across the primary of the power transformer.—Harold B. Cook, Wichita, Kans.

Philco 70. These sets use a special volume control which is often difficult to obtain. To change to a different control the following changes should be made. The control we use is a 10,000 ohm unit. First take off the old control and install a new 10,000 to 15,000 ohm control tapered for antenna and cathode bias. Center arm to ground, left arm to cathode, right arm to antenna and coil. Now the connection marked "F" in the Philco schematic diagram, is connected in series with a 1,000 ohm, 1 watt resistor and goes to the cathode of the 24A tubes. The other connection marked "G" in the Philco schematic goes to the cathode of the 27 oscillator tube. This completes the wiring. If any fringe howl is noticed an 0.5 mfd. condenser across the main plate supply will remove it.—Al's Radio Service, Tonawanda, N. Y.

Philco 71. A frequent complaint is that this set cuts out on strong local stations and lower powered stations can be heard weakly

in the background. The trouble is usually in the oscillator of the set. Changing the autodyne oscillator bias resistor from 15,000 to 10,000 ohms is the cure.—Al Sorgenfrei, St. Louis, Mo.

Philco 71 Code 221. This receiver sometimes has intermittent reception and distorts during the momentary break down. Change part #32 in the parts diagram and replace with a .05 mfd. 400 volt tubular condenser. Make sure you cut out the old bakelite condenser, the center lug is a dummy and used only to connect the resistor and lead from the volume control.—H. Evangelista, Jr., Philadelphia, Pa.

Philco 80-81. If volume drops and quality is mushy accompanied by a sputtering sound, or the volume varies, check the coupling condenser between the detector and the 42 audio tube for very high resistance short. The 1 megohm scale on an ohmmeter will generally show a slight deflection. Quite often the 42 tube will be weak since a high positive voltage is on the grid when this condenser shorts.—Donald G. Buck, N. Tonawanda, N. Y.

Philco 89. The cause for no plate or screen voltage on all tubes has been traced to a grounded primary in the second i-f transformer and compensating condenser assembly. Due to vibrations in the set, the stationary plate of this condenser has a tendency to shift and short to ground through the mounting screw to chassis. This trouble is easily remedied by loosening the mounting screw and shifting the assembly slightly until the short is removed. A replacement should be made to assure a foolproof job.—Fred B. Honchock, Monessen, Pa.

Philco 89-19. When the oscillator section won't work satisfactorily, try decreasing the 15,000 ohm cathode resistor of the 36 tube to 8,000 ohms. If it still refuses to work on low frequencies, change the type 36 socket to a six prong for a 77 tube. Wire up the same as the 36, tying suppressor grid to cathode and decrease the cathode resistor to 8,000 ohms.—James Rush, Greenwood, S. C.

Philco 90 With One 47. This set often does not work properly after being aligned. Strong stations come in extremely weak and far from their correct dial settings. Although the Philco instructions give the i-f of this set as 260 Kc. some were built to align at 175 Kc. The i-f's will align at either frequency but the gang condenser will

not. Realign at 175 Kc. and the set works fine.—Tom J. Davis, Cave Spring, Ga.

EDITOR'S NOTE: Refer to the Sylvania Tube Complement Book for the differences in i-f peaks for this set.

Philco 116 Code 122. Complaint:—Intermittent howling and squeals. Remedy: The coil shields on these sets are fastened to the chassis by means of lugs which do not bolt but simply spread to make contact. By making good grounds for these shields the trouble is immediately cured. This is sometimes difficult to find because when the chassis is moved, a good ground may be made and the set may play for some time before the trouble reappears.—G. W. McLean, Big Timber, Mont.

Philco 118. When the trouble is intermittent volume, check the by-pass condenser connected from the top on the volume control to ground through the 10,000 ohm resistor. In these sets I have found high resistance grounds on the bakelite cased condenser.—Barrett Radio Service, Sulphur Springs, Texas.

Philco 118. Cutting off of about 25% of the normal volume may be caused by an intermittent a-v-c filter condenser 0.05 mfd. We find it a good practice to replace all a-v-c condensers in this model even though they test good. The condenser mentioned above is a No. 11 in the Philco diagram.—Joseph S. Napora, Uniontown, Pa.

Philco 630, 635. Often there is a high pitched whistle when the volume is more than half way on. This trouble can easily be remedied by moving the wire leading to the grid cap of the 75 tube inside the insulating can of the 75 tube.—D. J. Spittel, Staten Island, N. Y.

Philco Chassis 650 Code 121. Weak and distorted signal from only a few powerful stations is found in these sets. The condenser part #3615-SU connecting the control grid on one of the 42 tubes is usually at fault. The condenser does not register open nor short as the leak is hardly noticeable on a meter.—L. A. Chamberland, Forestdale, R. I.

Pilot Dragon 10. If the set has an a-c hum which is hard to find, look for a ground at the reflector mounted behind the pilot light. There is a small piece of fiber insulation between the reflector and the dial. Sometimes the sharp corners of the reflector pierce the

insulation and ground the filament.—James F. Cochran, Westfield, N. Y.

Radiola 20 Air Cell Conversion. The following notes will be of assistance in installing type 30's for air cell operation of Radiola Model 20. It was found necessary to shunt a 1,000 ohm resistor across the primary of the second radio-frequency transformer. It was also necessary to remove four turns from the secondaries in order to get down to 1500 Kc. Remove turns one at a time until the trimmers peak sharply at the centers of their dials.—Harold B. Cook, Wichita, Kans.

RCA 6BK6, 8BK6. In wind charger installations where charger ground point is too close to the set ground point, (inside a radius of 10 feet), there is a chance of a voltage increase on the filament unless a 0.1 mfd., 400 volt condenser is connected from chassis to ground post, i.e., in series with ground and chassis. Never ground the negative side of charger to the same ground point of the set, as an increase of from 2 to 4 volts will result because of the wiring arrangement to supply 4 volts to vibrator and only 2 volts to filament. This will paralyze all tubes except the 30's and 49's. When the 8BK6 set fails to function, look for bad a-v-c tube. This tube seems to short easily.—Stockers, Ridgeway, Wisc.

RCA 6K, 6T. When servicing these models the .065 ohm heater resistor, R15 in the schematic, should be removed and a jumper used in its place. This resistor is omitted in later production of these sets. —E. W. Jacquet, Shreveport, La.

RCA D9-19. This model, as well as others using the magic eye, often becomes defective after the set has played for a short time. Remedy: Try replacing 1 megohm resistor between plate and target of 6E5. Replacing the 6E5 with a 6G5 tube, will often improve the operation of the eye.—Oliver F. Klein, Milwaukee, Wisc.

RCA 9K1, 9K2. These sets may play on powerful locals, but with low volume and distortion. By removing the second detector 6H6, the set will pick up. Check the first detector, screen condenser. This condenser is a 4700 mmfd. unit and usually the leakage is not large enough to cause a large screen voltage drop.—Robert Geller, Egg Harbor, N. J.

RCA 38-P. This set often lacks power after it is in use for some

time, has a habit of developing oscillation and the input condenser usually goes bad by short circuiting. This condenser is rated at 10 mfd. and should be replaced by one with a slightly higher voltage rating, capacity rating the same. The oscillator trouble is quite odd and is usually traced to the second detector a-v-c, 2B7 tube. One will note that when the receiver is operating, oscillation may take place which can be controlled by the volume control. This is caused by the shielded lead running to the cap of the second detector not fitting into the slot in the tube shield. The shielded lead **must** be grounded to the chassis.—Geo. F. Baptiste, Howard, R. I.

RCA 44. This Radiola model often develops a very strong oscillation over the entire dial. By removing the two copper stage shields housing the second r-f and detector, you will see a copper clip on each one which fits over the condenser shaft when the shields are in place. By bending these clips so they will make a tight fit over the condenser shaft, and applying a little sandpaper if it is necessary this trouble will be overcome entirely. These models have a rather annoying hum which can be reduced considerably by placing a 4 mfd. paper condenser across the rectifier output. This also increases the pep of the receiver some.—Anthony Piatti, Northville, Mich.

RCA 48. Intermittent operation and loud crackling noise is caused in some of these sets when an output coupling condenser breaks down. The way to find out if this is the trouble is to pull out one of the power tubes. If the radio plays better with one out, the coupling condenser is letting B voltage into the grids of the 45 power tubes. To make replacements, cut the two green wires that go to the grids of the 45 tubes, then connect two .025 mfd., 600 volt units from the grids of the 45 tubes to condenser bank number 5 and 7 (number 7 has no wire connected to it). It is best to replace both condensers. If the transformer gets hot, look at the rectifier tube socket for shorted contact connection.—Earl S. Daniel, Los Angeles, Calif.

RCA 80, G. E. H-31, Westinghouse WR-5. Distortion on low volume is quite common. Check the 110 ohm resistor going from cathode of the second detector to B plus. This resistor will be found to have changed its value. Replacing this unit will cure the trouble. —John Beisiadecki, Brooklyn, N. Y.

RCA 82, G. E., Westinghouse. Fading and scratching can often be traced to one of the intermediate transformers, the primary of which will show a higher resistance than the other (39 ohms is

correct). Examination of the winding may show corrosion under the piece of tape used to keep the wire from unwinding. Replacement of the transformer of course, is the best solution, but in case of emergency unwind two turns from the coil and reconnect to the lugs. In case of noisy reception and fading, examine all windings where tape of any kind is used to hold down the wire as corrosion may have broken the connections.—Lester C. Doerr, Edgerton, Wisc.

RCA 86T. I find that by connecting a .0001 condenser, or larger, from the antenna connection to the oscillator tuning condenser stator plates, there is a very marked increase in volume; about 25%.—J. S. Jackson, Jr., Bowling Green, Ky.

RCA R99. Weak and distorted output in this model may be due to the failure of the insulation on the bushings of C23 and C24, causing the speaker field to be shorted out removing the bias on the 2A3's. If set is dead, it might be the speaker field shield cover, touching the voice coil, causing a short. For best adjustment of the expander circuit in this model, set the plate current of the 6L7 at 2.2 mils.—F. U. Dillion, W. Hollywood, Calif.

RCA 118. When these sets fail to work satisfactorily on the 25 and 49 meter bands, check the condenser that by-passes the oscillator anode voltage dropping resistor for leakage. Noises in these sets when on the short wave bands, can be diminished by disconnecting the 6A7 grid lead from the wave changing switch and connecting it directly to the stator of the first tuning condenser. However, the set must be realigned after this change is made.—Chas. Marusak, Cleveland, Ohio.

RCA R-118, R-211. Abrupt fading may be due to opening a-f coupling condensers (.02 mfd.) located on resistor board and connected between the 6B7 and 41 tubes.—Bernard Krinsky, Brooklyn, N. Y.

RCA 120. If these sets oscillate as resonance is approached when attempting to align the r-f stages, replace the tubular condenser from cathode of 58 first r-f tube to ground with one of higher value. Some sets require as much as 0.25 mfd. capacity to stop oscillation.—Tim W. Shaw, Vernon, Texas.

RCA Victor T5. Since these phono-pickups have a needle pressure of about 6 oz. as compared to a modern pickup having only

2½ to 3 oz., the record life will be comparatively short before defects will occur in the grooves. I have reduced the needle pressure from 6 oz. to 3 oz. by removing the two weights, each 1½ oz., from the arm of the pickup. This doubles the record life and the reproduction is better.—Matthew J. Socha, Brooklyn, N. Y.

RCA Victor R-10. This set has both the input and output transformers located in the same can. When the input transformer primary burns out, instead of replacing it, connect a 40,000 ohm resistor from the B plus to the plate of the 27 and a .02 condenser from the plate to the grid of the 47. The set plays as well as ever and the job is done cheaper and faster.—Larry Bowers, N. Uxbridge, Mass.

RCA Victor R-35. If the volume drops when you bump the chassis and the connections are all good, check the variable condensers. Remove the cotter pins on the condensers and insert washers thick enough to take up the play. Sometimes you may have to insulate the inside of the shield cans with paper to prevent the condensers shorting to the chassis.—Gilbert Lindstrom, Aurora, Nebr.

RCA Victor RE-39, R-55, RE-57. A common trouble encountered in these sets is low volume which will usually be found in the detector stage. The resistor R5 in the screen of the detector is usually open or changed to a very high value, probably around 30 megohms. The screen bypass C11 may check okey, but it often gives trouble and should be replaced. To permanently remedy the above trouble, change the detector screen as follows: Remove 1.5 megohm resistor R5 from the circuit, connect two 0.1 megohm resistors in series from B plus end of R17 to B minus end of this resistor. At junctions of the two 0.1 megohm resistors, connect another 0.1 megohm unit and connect detector screen to B minus end of this last resistor. Connect condenser C11 screen to cathode, as before. After this change, the set will have better sensitivity and will handle more volume than before. This change has been made on several sets and they have given no trouble of this nature in more than two years operation.—R. L. Foster, Scottsville, Ohio.

RCA Victor R50, R55. When these sets are inoperative until the a-v-c tube is withdrawn, the trouble is usually a shorted 0.1 mfd. condenser from the a-v-c grid coil to ground. This is the blue lead from the capacitor pack in S. P. U. unit. Replace pack or disconnect blue wire and install a new 0.1 mfd. by-pass condenser. William Doty, New York, N. Y.

RCA Victor RE52. Distortion is often caused by a defective .001 mfd. bypass condenser in the plate circuit of the detector. Jesse Beczak, Pittsburgh, Pa.

RCA Victor; Westinghouse; G. E. Models:—80, 82, R15, R7, 86; WR5, WR6, WR8, WR7; H31, H61, H71. If confronted with a loud hum, try taking the output tubes out of the circuit one at a time, being sure that one is in the circuit while the other is out. Usually with these particular sets the opening of one side of the secondary of the input transformer with both power output tubes in the circuit will cause the loud hum. By taking the tube out of the open circuit the hum will disappear and the set will sound almost normal. Knowing the above will often facilitate the quoting of a job price in the home and will add to one's good reputation. —Keith Howard, Santa Ana, Calif.

RCA Victor 280. Lack of volume in this set may be due to an open in the reactor coil L-16 of 3,200 ohms. One end of this coil is connected inconspicuously to the volume control. The leads from the coil are very fine and should be checked. —Baer Radio Service, Roslindale, Mass.

Remler 28, 46, 47, 60, 71, 72, 54 and Norco 140, 170, 171, 178. The coils used in these sets either have an extremely thin layer of varnish for protection or none at all. In damp weather the coils in these sets absorb moisture, creating a high resistance leakage path between various lugs on the coil-form, causing cross modulation (monkey chatter) or weakening the signal strength. To remedy the fault, heat the coils (after taking them out of the set) in an oven at a temperature around 150 degrees for about ten minutes, then dip the end of the coil-form with the lugs into a pot with melted commercial wax, thus giving a protective coating against humidity. If the wax is not available, a layer of shellac or varnish or a similar protective coating will do. The leakage path has been known to range from 50,000 ohms to 42 megohms. The same leakage will be observed on coils used by other manufacturers if the coil-forms are not protected properly against dampness.—M. Margossian, Oakland, Calif.

Remler 28 AC-DC "Scottie." When set breaks into motor-boating, with no signal anywhere on the dial, check the insulating fibre washers on screws holding the dial plate on metal baffle. The dial plate is insulated from chassis with these fibre washers. Quite often when screws are too tight, these washers break and thus short

the insulated dial plate to ground. To remedy the situation simply replace fibre washers.—M. Margossian, Oakland, Calif.

Remler 45. The set becomes dead intermittently when shaken or jarred. Check the tone control condenser (.05 mfd. 600 volt) and you will find it shorting intermittently when shaken, thus shorting the plate of the 6F6 to ground. Replace this condenser to cure trouble.—M. Margossian, Oakland, Calif.

Remler 45, 71, 72, 89, 89C. When any of these sets prove to be very weak or dead on the high end (16 to 18 megacycles) of the short wave band, replace the 6C5 with a new Sylvania 6J5 tube and realign the set. The pickup of shortwave signals will be amazing. No changes in the circuit will be necessary. Because of its low inter-electrode capacities, 6J5 is a better tube than the 6C5 in the oscillator stage. The earlier model 72 receivers as well as all the models listed above have the 6C5 as an oscillator. However, the later Remler model 72 receivers use the 6J5 for the oscillator.—M. Margossian, Oakland, Calif.

Remler "Scottie" 46. To reduce the hum in these sets, do the following: First check to see if the speaker has a bucking coil. If it does, simply add a .05 mfd. 200 volt paper condenser across the speaker field coil connections. If the speaker does not have a hum bucking coil (due to the insufficient filter of the 4-4 mfd. dry electrolytic condenser the hum will be fairly prominent) replace the 4-4 mfd. 450 volt dry electrolytic with another of similar construction, but with 8-4 mfd. 450 volt capacity. Be sure to place the 8 mfd. section first (condenser input) as filtering of hum will be more effective. A 8-8 mfd. 450 volt condenser cannot be used because of space limitations. —M. Margossian, Oakland, Calif.

Remler 52, Norco 178, Tot 178, Sky Raider 178. These sets originally had the plate condenser on the 42 output tube connected from plate to ground. In this position the condenser was subject to high voltage at certain times. In the later models the condenser is across the output transformer primary, namely from plate to screen of the 42. This produces the same tone quality and the condenser is subject to less overload. This is also true of the Remler Scottie Model 46, which uses a 6F6 output tube. The condenser under discussion is .01 mfd. A change to this new arrangement is recommended.—Walter T. Walsh, San Francisco, Calif.

Remler 64. When the set breaks into high pitch oscillation at the high end of the short wave band, change the 100,000 ohms (No. 8 resistor-Rider) resistor on the oscillator input control grid prong of the 6A8 tube to 50,000 ohms. If oscillations persist reduce said resistance to 25,000 ohms and all such painful-to-ear oscillations will disappear improving the short wave band of the set considerably. Incidentally, if you happen to have the Rider Manual No. 7, make the following correction in the diagram of this set: Interchange the wiring connections (on your diagram) of 6A8 Nos. 6 and 7 prongs.—M. Margossian, Oakland, Calif.

Remler 71 (1936-37). When this set whistles on the lower end of the broadcast band, check to see if the plate by-pass .0003 mfd. condenser on the audio 6K7 is there. Rider's Manual Volume VII shows that this condenser is not in the original diagram and it is missing on some sets marketed. Adding such a condenser (from the plate of audio 6K7 to ground) on the audio stage 6K7 plate will make all whistles disappear.—M. Margossian, Oakland, Calif.

Remler 71. When the set is noisy on short wave band, or subject to microphonic noises, ground thoroughly the braided flexible wire which connects the rear end plates of all the three sections of the tuning variable condenser (ganged) to ground. This will provide a positive direct connection from the rotor section to ground. A complete soldering job, several places along the braided wire is necessary in all short wave sets. A poorly grounded rotor will always cause microphonic noises, particularly on short wave. M. Margossian, Oakland, Calif.

Remler 89, 89C. The earlier receivers of these two models used a .05 mfd. 200 volt type 244 paper condenser. These condensers showed leakages of various degrees. When such condensers are found in these two models or in other receivers, replace them by an equivalent unit carrying different type numbers such as Aerovox .05 mfd. 200 volts type 284.—M. Margossian, Oakland, Calif.

Remler-Norco 180. These receivers have a tendency to motorboat strongly on the low end (550 to 700 Kc) of the broadcast band. To remedy this fault remove the cathode by-pass to ground 0.1 mfd. 200 volt condenser from the 6D6 socket and replace it with an 0.25 mfd. 200 volt condenser. The earlier models marketed, did not have this change.—M. Margossian, Oakland, Calif.

Sentinel 39B. A fuzzy sound in the speaker of this set is common. In some it is very slight and in others, very annoying. At times the speaker sounds as if it were rattling. It is more noticeable at high volume. To correct, place a .003 mfd. condenser from each plate of the 19 output direct to the chassis. Each plate must have a separate condenser. This value will have no effect on the high notes, yet the capacity is high enough to cut out the fuzzy sound.

Another trouble is no reception on lower short wave band and in extreme cases, dead spots on other bands or possibly no reception at all. Try replacing the type 1C6 tube with a Sylvania 1C6. Another source of annoyance is a slightly microphonic 34 first audio tube. This is more noticeable on the short wave bands when the set is tuned to a station that is fading badly. A new Sylvania 34 will cure this.—Robert J. Ridenour, Fredericktown, Ohio.

Serenader 10 Tube, Airline 1955. Intermittent cutting out of signals: Oscillator plate to grid .01 mfd. coupling condenser opens up intermittently thus stopping oscillation. Easily traced by testing for the oscillator signal. A. B. Chismar, Streator, Ill.

Silver Marshall Chassis 60. This model uses a 1 megohm grid resistor in series with a bias cell to ground on the 6F5 audio tube. Due to the high grid resistor and small bias, the grid draws current on large signals and lowers the voltage of the bias cell. Distortion results. Change the 1 megohm to ½ megohm, 1/5 watt unit. There is very little loss in volume.—L. W. Krizan, Chicago, Ill.

Silvertone Battery Receivers. We dealers in small towns and rural communities find that people who own Sears battery sets are disappointed to learn that the A battery is a large flat type and that some tubes are of an odd type that are not sold by us dealers.

I have found that the flat type of A battery used on some of these battery sets, can be replaced very easily and profitably by removing the cardboard container surrounding the old battery and place in it 8 regular type ea radio type dry cells. These must be connected in two banks, of four in parallel and these two banks in series. All connections should be soldered. This gives the 5 volts which is the same as the original. In considering the life of this replacement most dry cells are rated at 35 ampere hours. The total life can be figured after determining the total filament drain.

Another kink on these sets is that the type 951 tube can be replaced with a Sylvania type 32 or 34 by changing the tube shield.

The performance of the set seems much better with this type than with the original.—George W. Nikolai, Kissimee, Fla.

EDITORS NOTE: Sylvania type 1B4 may be used for the 951.

Silvertone 1722. When complaint of insufficient short wave sensitivity is received try a new 56 tube. If this doesn't help try increasing the coupling of the short wave antenna coil. The single turn of green silk covered wire should be moved as close as possible to the other windings on the coil. An additional ground connection from the coil should be made to the low side of the trimmer condenser mounted on the wave changing switch frame. There is one ground connection from the coil to the variable tuning condenser frame but this should not be disturbed. A hum which cannot be eliminated with the hum balancing adjustment is due to poorly matched 2A3H tubes. The plate current of these tubes must be nearly equal in order to obtain this balance. Two new Sylvania 2A3 tubes will do wonders in this respect.—Steve Pochiber, Jr., Leechburg, Pa.

Silvertone 1831. When replacing i-f transformers in this model, do not put too much confidence in your service notes. All service notes that I have seen give the i-f as 480, but I find in this particular model that some of the sets are tuned to 175 Kc.

Editor's Note: The Sylvania Tube Complement Book gives this set a 445 Kc. listing, which is that supplied by the manufacturer.—E. W. Wood, Jasper, Ala.

Silvertone 1850, 1851, 1862, 1868, 1870. All available data for these sets states the i-f at 480 Kc. In working on two different sets of these models we could not align at 480, but found alignment easy at 175 Kc.—G. W. McLean, Big Timber, Mont.

Simplex AC-DC Models. To eliminate tunable hum: reconnect the condenser which is now between B minus and one side of the power line, so that it is directly across the line.—Anderson Radio Hospital, N. B. Anderson, Seattle, Wash.

Simplex Model D A. I have found a number of these sets with the i-f coils open from moisture. To repair, carefully remove coil, unwind about two layers of the inside winding holding wire in either hand. Pull gently and insulation will part at break. Repair, cement, replace coil and realign set.—Lester Wucoff, Marmaduke, Ark.

Simplex V. When tubes, condensers, resistors, and wiring all check perfect yet the set will fail at times without voltage change, look for bad connections to the insulated posts supporting the common wiring junction points. The rosin core solder used isn't always sweated out and under heat forms an occasional insulator which disappears under the load of testing.—Henry Berg, Pittsburgh, Pa.

Skyrover 224. This set may develop an oscillation whistle after several minutes of operation. To cure, replace the .25 mfd. plate by-pass condenser of the third r-f tube with an 0.5 mfd. unit.—A. B. Chismar, Streator, Ill.

Sonora 70S. If set hums and the volume control does not reduce the volume correctly, look for an open 8 mfd. electrolytic condenser located under the resistor-condenser bank. This condenser should be replaced with one having a rated voltage of 300 volts.—Lee White, Jr., New Orleans, La.

Sparton 9, 420. Increasing the value of the voltage divider to 100,000 ohms from the old style low resistance type will raise the sensitivity of these sets. Use two 50,000 ohm 1 watt carbon resistors in series. Connect one from high positive to screen and one from screen to low end of volume control; the cathode bias resistor in series with center volume control connection and maximum end of volume control to ground.—Henry Berg, Pittsburgh, Pa.

Sparton 14. Distortion and intermittent hum may be due to the speaker field coil shorting. The best way to locate this is to hold a screw driver to the speaker—Al's Radio Service, Tonawanda, N. Y.

Sparton 16. If this set has a tendency to drift off the station, becomes weak in volume and whistles, check the connections on the oscillator coil which is under a shield. One connection is made with a small bolt and in time is apt to work loose. It is a good idea to solder this bolt.—George Curtis, Chicago, Ill.

Sparton 61, 62. The grid lead with metal shield is placed between and very close to the 25Z5 and 43 tubes. The heat often ruins the insulation and the movement of the grid wire crumbles the insulation thus shorting the lead to ground. Replace with a well insulated, shielded wire.—C. A. Vaughn, Los Angeles, Calif.

Sparton 111A, 301. If hum still remains after everything checks OK, clean and tighten the ground connection of the large wirewound

7,000 ohm resistor located back of the two 50 tubes on the power converter.—S. Wiesenberger, Cleveland, Ohio.

Sparton 930. When this set goes in and out of oscillation sometimes as often as ten times a second and at the same time the detector voltage respectively changes, look for the trouble at the connections to the r-f coils near the sub panel. Through corrosion the solder connections come loose from two grid leads and one plate lead and will make and break contact. Cleaning and resoldering eliminates the trouble.

This particular model will in time develop a violent high frequency howl at a low point on the volume control. The trouble has been found in the series plate choke to the detector tube. Through corrosion part of the choke winding shorts out leaving too little reactance in the circuit. Replace with a new choke to remedy the trouble.—Keith Howard, Santa Ana, Calif.

Sparton (All Models Using 485's). Bad motorboating, particularly true when replacing old tubes with new ones. Before realigning at 1200 Kc., clean thoroughly all wiper contacts on rotor of the condenser gang and apply carbona. This will eliminate motorboating and results in greater sensitivity.—Vito F. Daidone, Newark, N. J.

Stewart-Warner 111, 115. Tunable hum may be caused by condenser No. 15 opening. If you change condenser No. 34 in Stewart-Warner 111, be sure it is not wax or tar filled. This chassis stands on end and heat from the 43 will cause wax or tar to run down and mess up the gang condenser and might mean a replacement of the gang.—Ivan L. Crowe, Chicago, Ill.

Stewart Warner 123-123A. These models may have condenser trouble in the fixed tone control circuit consisting of a .01 mfd. 600 volt condenser from the plate of the 41 output tube to the chassis. When installing a new condenser, connect a .01 mfd. 400 volt unit from plate to suppressor grid of the 41 to eliminate future trouble. This puts the condenser across the transformer primary.—D. A. Brown, Marion, Ohio.

Stewart Warner R-180-A. This set may lack pep with the dial off calibration and will be impossible to realign at the low frequency end of the dial, below 570 Kc. If the set checks okey, add a .0025 mfd. condenser to the .0054 mfd. condenser which is already across

the padder and the set will align perfectly over the entire broadcast band. A great increase in volume will also be obtained.—N. E. Nelson, Mayville, N. D.

Stewart Warner Converter 301A. If this converter does not work satisfactorily make the following changes. The plate voltage of the broadcast receiver to the converter type 27 oscillator is regularly dropped through a 50,000 ohm resistor, giving a no-load potential at the plate of 90 volts, dropping to half this under load. This voltage is further dropped through a 100,000 ohm resistor to the plate and screen of the 24A second detector tube, providing about 20 volts. These voltages are much too low. Substitute a 10,000 resistor for the 50,000 ohm unit, and a variable 50,000 ohm resistor for the 100,000 ohm unit. Adjust the 50,000 ohm resistor for best results. The improvement is remarkable.—Harold B. Cook, Wichita, Kans.

Stewart Warner 1261. When the broadcast band is okey, but the short wave band is weak, try raising the oscillator plate voltage by shunting a 10,000 ohm resistor across the oscillator plate supply resistor.—Al's Radio Service, Tonawanda, N. Y.

Stromberg Carlson 64. The power transformer on this set may overheat and smoke. Don't suspect the windings but check the first electrolytic condenser. This is often leaky and causes such trouble.—Al's Radio Service, Tonawanda, N. Y.

Stromberg Carlson 345. More bass response on the 345 receivers can be obtained by making the simple change outlined below. This change is incorporated in all receivers manufactured after September 1, 1938.

Remove the 4700 ohm resistor (R-17) from the volume control tap and replace with a 10,000 ohm resistor, Pc. 26345.

Remove the .15 mf. capacitor (C-37) from the volume control tap and replace with a .1 mf. capacitor, Pc. 24402.

Remove the .001 mf. capacitor (C-42) from the high side of the volume control and replace with a .04 mf. capacitor, Pc. 24405.

Caution: Do not mistake capacitor C-38 for one of the capacitors to be changed.—Stromberg Carlson, Rochester, N. Y.

Tiffany Tone 157. The airplane type dial may work hard and slip, causing much annoyance. The calibration will possibly have

shifted. The remedy is to remove the chassis and slightly bend the dial bracket back. A lock washer at the point where the tuning condenser shaft goes through binds and causes the shaft to turn hard. Another general hint about airplane dials:—when the calibration seems high or low for any station, it may be remedied by checking up on the alignment of the holes where the chassis is held in place in the cabinet. If these holes are out of line, the chassis may not fit perfectly in place. The escutcheon may press one side of the dial back, causing the entire tuning assembly to be pushed back resulting in a change in frequency.—John C. Gill, San Diego, Calif.

Trav-Ler 51. Noisy operation frequently shows up, especially if the set is jarred. The shield on the grid lead of the 75 tube may be shorting to the can of the electrolytic condenser. The can of the condenser is at negative potential with respect to the chassis.—Tim W. Shaw, Vernon, Texas.

Truetone 667. Background hiss on local stations in which the trouble seems to be a defective r-f tube. Look for lead broken on r-f section of tuning condenser between condenser and grid cap of 6K7 r-f tube.—H. Plouf, Springfield, Mass.

U. S. Gloritone 99A. Intermittent operation in this model is often caused by the .002 mfd. condenser connected between the plate of the first 24A and the first i-f transformer. Another trouble often found is non-operation due to two open resistors, both located in what is known as a Candohm unit, located in the rear of the chassis. These are 11,000 and 10,000 ohms feeding the plate of the 35/51 and the screen grid of the first 24A and the 35/51, respectively.—Wesley Carpenter, Edwardsville, Pa.

Wells Gardner 0C. The oscillator tube of this set is a 76 triode. By changing the socket to an octal type and using a Sylvania metal 6J5 improved oscillator performance is obtained and the set is improved considerably on the short wave band. Through this change the receiver will pull in stations that were never heard before and will also clear up spotty reception on the short wave band. The only circuit change necessary in some of the early models is the oscillator plate load resistor. If the oscillator plate resistor is above 30,000 ohm for 100 volt operation, change to 30,000 ohms with a cathode resistor of 1500 ohms. For higher voltage use higher values, double the voltage, double the load resistor. This same job can be performed on many superheterodynes. Be sure to use the Sylvania metal 6J5.—Geo. F. Baptiste, Howard, R. I.

Wells-Gardner 5E Series. If this set is noisy replace the 50 mmf. condenser between the plate of the 34 i-f tube and the grid of the second detector. This is not a regular condenser but is a special capacity wire type that can be replaced with a .001 mica condenser.—D. Gordon, DeLand, Fla.

Wells Gardner 052. This particular model is often found inoperative with screen voltage and cathode voltage high. This is all caused by the two 40,000 ohm resistors changing values. These two resistors are in the same can with the i-f transformers and are mounted on the terminal strip in same. Replace both resistors and the volume control if necessary.—C. DeWail, San Antonio, Texas.

Wilcox-Gay 50-A. On this model the dirt will sift in and get down between the voice coil and the pole piece with the result that it sounds terrible. To remedy this, remove the speaker and cut a piece of soft felt or soft leather just a little larger than the diameter of the voice coil and glue it over the voice coil opening. When it gets dry you can put a handful of sand on it and the tone will not be affected. I have used this a number of times and it gives excellent results, especially on the horizontal type mounted speaker. It may be used on all dynamic speakers but shows the best results on the speakers that are mounted horizontally or speaker shooting the voice and music upwards.—Tommie Birdwell, Iowa Park, Texas.

Zenith 12S265, 15U269 (1938). Microphonic noises, accompanied by a low rumbling with the volume at a minimum is usually caused by a microphonic 6J5G first a-f tube. Use a Sylvania 6J5G. Shielding of this tube with a loose fitting shield may or may not be necessary.—J. S. Napora, Uniontown, Pa.

Zenith 15U269 (1938). To reduce the number of complaints on the split-dial mechanism, carefully lubricate all bearings and tighten all set screws, especially the two that hold the lever on the wave band switch. If these screws work loose, the whole dial assembly will "jam."

Weak reception accompanied by a high noise level was caused by an open in the 6K7G r-f plate choke, Zenith Part #20-135. This choke has opened in several cases and the defect was usually found at the choke terminals.—J. S. Napora, Uniontown, Pa.

Zenith 39A. Set weak or dead.—Look for a corroded wire connection on terminal strip plugging into power pack.—Oliver F. Klein, Milwaukee, Wisc.

Zenith 55-127, 55-150. A common complaint on these sets is that after a few minutes of operation they begin to fade until finally only the locals are audible. Sometimes it may take as long as half an hour to fade completely out. In either case, a repair can be effected by replacing the 6A8G cathode resistor. This unit is mounted directly at the tube socket toward the front of the chassis. Replace with 400 ohm ½ watt resistor.—Bernard Greene, Petersburg, Va.

Zenith 91, 92. Many of these sets suffer from lack of volume and poor tone. When the a-v-c tube (24A) is removed the sensitivity comes up, but the set overloads badly on strong signals. The trouble is caused by the resistor in the screen-cathode and audio transformer CT circuit. These resistors generally deteriorate with age. The CT to cathode portion should check 2500 ohms and the cathode-screen section should check 10,000 ohms. In later series of the same model the screen to cathode checks 15,000 ohms.

Tuning meters on this model often open which results in no plate voltage on the first r-f tube. Temporary repair can be made by shorting out the meter.

Another type of trouble in these sets is poor bass response and apparently poor sensitivity. This is caused by an open in the 0.5 mfd. condenser part #22-113 in the cathode of the second detector tube.—Donald G. Buck, N. Tonawanda, N. Y.

Zenith 230. This receiver often has an intermittent trouble that is very hard to find. All voltages will check the same when the set is in operation or completely dead and the coupling condensers will all check ok. The last i-f transformer is usually at fault. Inspection of the i-f unit will disclose a rosin joint on the secondary. All joints should be resoldered.—Harold B. Cook, Wichita, Kans.

Zenith 755. Watch these sets for two defects; a short circuit in the tuning meter leads and an intermittent short between primary and secondary of the i-f transformers. The cure for the first is a good doping with lacquer type radio cement and the second requires disassembling the i-f transformers and insulating the lower coil where the leads from the upper coil pass it. The second condition is attended by a sharp rasping buzz in the speaker during the operation of the set, similar to the interference set up by a leaking power transformer on the electric lines.—Henry Berg, Pittsburgh, Pa.

Zenith Chassis 1004. A comprehensive survey of repair jobs on this type of receiver reveals the following trouble spots. If the receiver is noisy in spots on the "C" band, check the dial pulley—move it away from dial pan, tone and sensitivity switches, volume control and 16 mmf. condenser, C21 is schematic diagram. If hum is experienced check tubes, open filter, or open electrostatic shields on power transformer. The latter can be remedied by by-passing the a-c line with a .001 mica-condenser. If the stations ride in, check the alignment and the .0012 mf. condenser in oscillator plate circuit.—Herbert Hass, Chicago, Ill.

MISCELLANEOUS HINTS

All Radios Using A.F.C. On most radios using automatic frequency control, a 6H6G is used as the discriminator and a 6N7G as the oscillator control voltage amplifier. When the 6H6G needs replacing check each cathode current of the new tube. To retain a balanced bridge circuit without needing to retrim the a.f.c. trimmer. it is absolutely necessary to have a tube in which the diode currents are nearly the same. Unless this is observed, the a.f.c. will not function properly. Sylvania 6H6G's will usually be found satisfactory.—Vito F. Daidone, Newark, N. J.

Battery Charger Interference. Several times a persistent noise covering an area of several blocks has been traced to tungar battery chargers with bulbs. Although performing satisfactorily, they generate a very annoying interference. New bulbs will remedy the trouble. One offender is the 3 ampere twin bulb type, but the worst offenders are the 6 ampere single bulb type.—G. W. McLean. Big Timber, Mont.

Cabinet Protector. I use cellophane to protect the fine finish on my sets that I sell or rent out. The sheet of cellophane is shaped according to the layout of the controls on the set. A small amount of cement placed in each corner of the cellophane holds it firmly in place. An arrangement of this type prevents finger nail scratches around the knobs and does not detract from the appearance of the radio. Scotch tape may be used instead of cement.—Richard Dawson, The Dalles, Oregon.

Don'ts on Installing Battery Sets. 1. Don't fail to use a filament current limiting resistor when installing an air cell battery. Failure to use the resistor results in short tube life, increased "B" current drain, frequent call backs, and a dissatisfied customer. The resistor costs only a few cents, yet it may cost you many dollars by your negligence. If a ballast tube is used, the resistor, of course, will not be necessary.

2. Don't fail to observe the polarity of the "A" connections. Improper polarity often means an increase of 10 ma. in B current drain with resultant short B battery life.

3. Don't fail to use a good ground connection on any battery set, it means as much as 50% of good reception in some cases.—Joseph S. Napora, Uniontown, Pa.

Farm Receivers. Many farm sets use a 6 volt storage battery and 2 volt tubes. Some of these sets have the 2 volt leads coming from the set in the cable with the 6 volt leads. If the owner hooked the lead wire to the wrong post the tubes would be damaged. We get around this by painting the posts red, blue and yellow and the clips on the cable to match. Thus, all that is necessary is to match colors which saves a lot of grief.—Bernard Greene, Petersburg, Va.

Frozen Electrolytics. During the cold months when a low hum is encountered in a receiver that has been in a cold place, look for a frozen electrolytic condenser. The best thing to do in such a case is to leave the condenser thaw out gradually in a warm place. I have encountered this trouble in delivering and in servicing receivers located in rooms that were shut off from the rest of the house.—Harry Farber, Syracuse, N. Y.

Hum. In older sets, tunable hum is experienced and in most cases this can be eliminated by connecting a small condenser not larger than .01 mfd. from each plate of the rectifier to the filament of the same tube. This is a sure-fire way of eliminating hum that is experienced when a station is properly tuned in.—William F. Howard, Cincinnati, Ohio.

Insulating Aerials. Common copper gasoline tubing makes a good shield for auto aerial and similar lead-ins. Simply push in ordinary insulated wire before bending the tubing, then install. You don't have to worry about dampness in the insulation if you heat the end of this tubing with your soldering iron and run a little paraffin into it.—O. T. Bolick, Davidson, N. C.

Intermittent Cut-Off. Some time ago I had a set in for intermittent cut-off. It was one of those cases where touching any part restored operation for awhile. I tried the old stunt of heating the under side of the chassis quickly with an electric heater but with no success. I then took a spot light with a 32 CP bulb, adjusted it for a sharp focus at two feet and shot the light on various condensers for several minutes each. Eventually the fifth unit opened under the heat of the lamp. I have used this scheme several times since with the same good results.—Harold A. Duvall, Los Angeles, Calif.

Label For Stolen Radios. No doubt many servicemen have had trouble with stolen rental radios. In our location, which is a summer resort, we lost quite a few sets until we used stickers on the bottom of the cabinet where only a serviceman could see them. If all servicemen would use this method and cooperate in the return of stolen sets the individual serviceman would suffer much less than in the past. Our stickers read: "Fellow Servicemen; this is a rental set stolen from PARK RADIO CENTER, Seaside Park, N. J., Phone 265, please communicate with above."—Park Radio Center, Seaside Park, N. J.

Mirror For Servicing. If there is a place in the radio set where it is hard to check for loose connections or to see the code of a resistor a dentist's mirror makes a valuable tool for use in these places.—Carl Flor, Milwaukee, Wis.

Noisy Transformers. To eliminate the buzz in transformers, loosen the screws which hold the laminations in place. Then with a brush apply enough varnish to soak the core. Let it stand for about an hour and then tighten. Do not use shellac because it will damage the enamel covering of the wire.—Frank Kreiger, Chicago, Ill.

PZH Tube. This tube is not directly interchangeable with type 2A5 as specified in several interchangeable tube charts. The 2A5 is a six prong tube, whereas the PZH has seven pins. In the PZH the suppressor is brought out to a separate pin. This necessitates a change in socket.—Clarence M. Doyle, Utica, N. Y.

Power Packs With Bus Bar Wiring. Power packs of a few large receivers are wired with bus wire. I have known of several sets with power packs of this type being brought in to the shop and after ten minutes of operation would develop an a-c hum and drown out the signal. It was found that the bus wire heating and expanding

caused the foil to be torn on the filter condensers, but when cool, would contract and make connection again. Replace the torn filter and rewire with flexible wire to end all trouble.—Harold B. Cook, Wichita, Kans.

Push Button Tuning. If you have trouble with the push buttons sticking in an automatic tuning radio, it's because the radio is kept where there is too much sun or heat. The heat swells the buttons so that they stick on the sides. Also the springs often lose their tension. Remove the buttons that stick and sand the high spots down. If the springs cause the trouble, stretch them for better tension or replace with new ones. If the buttons are replaced they should be of some material other than bone or rubber then they will not warp. New springs should be of stronger steel for better tension.—George Baer, Roslindale Park, Mass.

Push Pull Magnetic Speaker Repair. When one half of a magnetic speaker from a push-pull output stage burns out, a temporary repair may be effected by using a resistor of d-c resistance value equal to the remaining half. While the volume may not be as great as the original the result is usually a satisfied customer until a new speaker can be obtained. This is not recommended when a new speaker is in stock and can be sold, but if the customer cannot afford it the foregoing answers a problem.—Henry Berg, Pittsburgh, Pa.

Replacing Octal Tubes. In servicing sets using the octal base tubes, I occasionally find that they motorboat or may be dead. The cause is often traced to some of the tubes being in the wrong socket. The owner usually takes out some or all of the tubes and in putting them back, puts some in the wrong sockets. Always check the tubes with the service diagram to make sure the correct sockets are being used.—Edmond Falconbury, Kings Mountain, Ky.

12Z3 Rectifiers. Several sets using the 12Z3 as a rectifier have a current drain exceeding or approaching too closely the maximum (60 Ma.) output of this tube. By changing the rectifier socket and changing the series dropping resistor to the correct resistance value a 25Z5 may be substituted with better results. The 25Z5 may be used with both plates and cathodes paralleled or may be used with the one cathode to supply plate current and the other to supply speaker field current. In the latter connection, an extra filter capacitor is required across the speaker field supply.—Roesch Radio Service, Cleveland, Ohio.

Receiver Whistles. A considerable number of cheap radio sets of different models and makes that use a single type 43 output tube give trouble in the form of an audio whistle. If one looks over such a set he may find no resistor in the screen grid lead, the lead being connected directly with the plate supply of the 43 tube. The trouble may be overcome by cutting the lead going to the screen grid terminal and inserting a 1000 ohm resistor in series. Also, keep the plate lead from the 43 tube away from all other grid leads as far as possible.—George F. Baptiste, Howard, R. I.

Refrigerator Interference. Annoying interference from electrical refrigerators can often be overcome by connecting metal braid from the frame of the motor to the frame of the refrigerator. This provides a path for the leakage of the static electricity generated by the belt. I believe that most of the new refrigerators are now bonded this way.—G. W. McLean, Big Timber, Mont.

Screw Holder. A service tool that I have found indispensable is made from a six inch piece of ¼ inch copper tubing and two pieces of clock spring about 1 inch long. Pinch one end of the tubing in a vise until it is almost closed. Insert the two pieces of spring leaving about ½ inch extended being sure that the two pieces spread away from each other, then pinch the end of the tubing slightly. This makes a useful tool for holding split head screws.—Richard Dawson, The Dalles, Ore.

Service Light. An unusually handy servicing light can be made by removing the batteries from a fountain pen type of flashlight and connecting a flexible cord from a small filament transformer to the light bulb. This small handy light makes it convenient to test in the darkest and most inaccessible parts of a radio chassis. Eliminating the batteries cuts operating costs to a fraction since such a light is used so much.—Manuel Holtzman, Portland, Ore.

Slipping Cable, Open Grid, Glass Jar Hints. The "fish cord" type of dial cable may be remedied for slipping by brushing with a solution of gasoline and rosin. The gasoline will evaporate and leave the rosin in the cable.

Symptoms of an open grid many times leads to an open or "rosin joint" in the control grid cap. This cap should be examined first as it will sometimes save hours of work.

If you have a number of screw cap jars around the shop to keep your small parts in, but which seem to always be getting in the way,

fasten the lids to the under side of a shelf. You can then hang the jars and make them convenient.—Eugene Kingrey, Dayton, Ohio.

Soldering Iron Holder. A good soldering iron holder can be made from a piece of asbestos pipe covering such as is used on steam pipes. A piece about a foot long, closed at one end, and supported under the edge of the bench (or on top if preferred) enables you to keep the iron where it can do no damage.—R. C. Wyann, Medford, Mass.

Speaker Notes. A real pest and hard to find trouble is the cause of low volume in any radio receiver using dual speakers when everything tests to perfection including voltages, resistors, condensers, tubes, etc. The cause of the low volume may be due to improper phasing of the speaker and can be checked very easily with a pocket compass. To check proper phasing for dual speakers field, hold the compass near the first speaker and then near the other with the receiver turned on. If incorrect polarity or improper phasing is present the deflection of the compass will not be the same for both speaker fields.—Geo. F. Baptiste, Howard, R. I.

Sticker Advertising. When finishing up a service job put a small sticker* with your name and address and your "service message" in the back of the radio cabinet. The next time service is needed it will be a reminder to call you.—S. Lewis, Philadelphia, Pa.

*The Sylvania Service Sticker No. 117 is especially designed for this purpose and is furnished with your imprint. A special glue is used so that the sticker will hold on metal and wood.

Tip On Soldering. When neat solder connections are wanted, mark the area which is not to be soldered with lead pencil. The solder will not adhere to the pencil mark and a nice appearing job is the result —Richard Dawson, The Dalles, Ore.

Traveling Lights. I have a wire extending the full length of my service bench on which two small pulleys are attached to a light with an enameled metal reflector. These traveling lights enable me to work on any part of my bench with plenty of light directly over me.—J. A. Cape, Jr., Atlanta, Ga.

Transformer Substitute. In case of a burned out primary coil on the audio transformer for either single or push-pull service and where replacement isn't readily available, the following procedure is satisfactory: Place a resistor across the primary terminals of about

twice the plate to cathode resistance of the preceeding tube. Connect a .02 mfd. condenser from the plate terminal of the resistor to the grid lead of the secondary. (In case of push-pull connect to only one grid lead). A center tap may be created on the secondary of an audio transformer by placing two regular value grid resistors across the secondary in series and using their connecting point as the center tap.—Robert A. Fifer, Los Angeles, Calif.

Tuning Eye Life Increased. Some of the cheaper sets, lacking in design refinements, secure seemingly miraculous results by "shooting up the juice." It is not at all unusual to find such sets applying 325 to 375 volts to plates of tubes rated at 250 max. Some tubes will take this for an amazingly long time without apparent ill effects, especially Sylvanias, but tuning indicator tubes will not. Do your customers and the tube manufacturers a favor by reducing the voltage applied. Add suitable series resistors in the B plus lead. Check the plate current drain and make sure that it is reasonably near the maker's rating. The fluorescent material used on the target in these tubes has very definite limitations and overloads will cause it to deteriorate and become dim.—Harl O. Piety, Georgetown, Texas.

Unmarked Tubes. Occasionally a tube becomes quite a mystery because light marking in manufacture or heat during use has destroyed all evidence of the type numbers. Put the tube in a refrigerator until it has had a chance to chill, then blow your breath on it. As the surface frosts over the numbers will appear. Scratch the identification on the base.—M. K. Walden, Coeur d'Alene, Idaho.

Vibrator Test. Many vibrators will stop delivering after starting and it is often difficult to determine if the trouble is in the set or the vibrator. Pull out vibrator, plug in analyzer (better yet an extension speaker cord) and plug vibrator in analyzer or speaker cord plug, then either set or vibrator can be jarred and the trouble localized.—Pat Daly Radio Service, Beardstown, Ill.

Voltage Record. After finishing the repair of a set take analyzer readings of all voltages and currents and record them on the chassis by each socket with an indelible pencil. Do this with new sets before you intsall them. It only takes a minute and you will save considerable time on later service jobs. Sell your customer on the fact that you have the readings recorded and can do future jobs with assurance.—Gilbert Lindstrom, Aurora, Nebr.

SERVICE TO SERVICEMEN

The Service Helps shown on the following pages are only a few of the generous assortment of Sylvania Sales and Service Helps made available by Sylvania Electric Products Inc., most of which are free upon request. Semi-technical literature for the serviceman such as Characteristic Sheets, Tube and Base Diagram Charts, Tube Correlation Charts, the Tube Complement Book at 35c and the Technical Manual at 35c, are in constant demand. Window displays, streamers and transparencies, price literature, circulars, book matches, electric signs, mailing cards, newspaper mats, and plain or imprinted tube stickers are provided generously as an assistance to dealers and servicemen. All items shown are typical—styles and prices are subject to change without notice.

Sylvania News, a regular monthly publication featuring a separate Technical Section, items of trade interest, personal interviews, and service helps, is available to everyone. Further information about Sylvania News, Sylvania Radio Tubes, and any of the sales or service helps, may be obtained from your local Sylvania Distributor, or by addressing your inquiries to Sylvania Electric Products Inc., Emporium, Pa.

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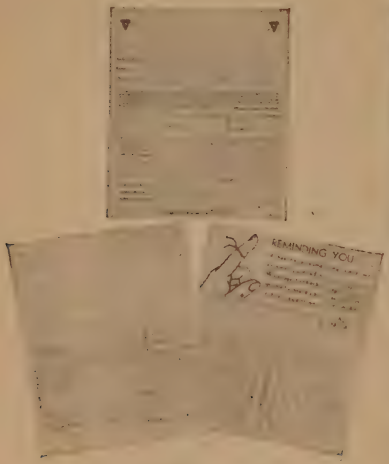

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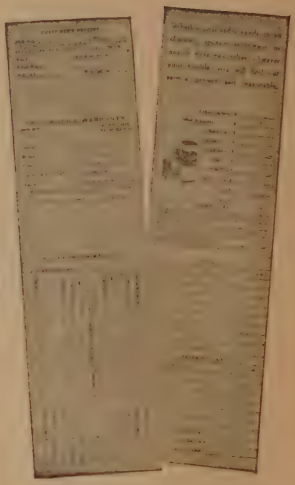

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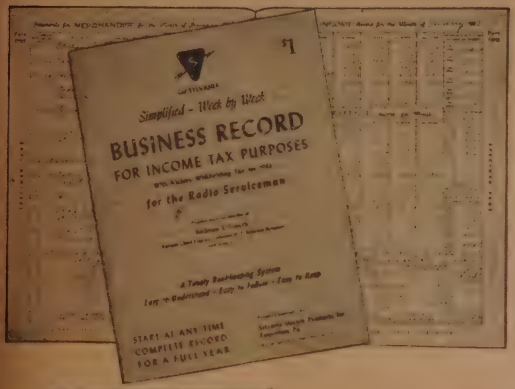

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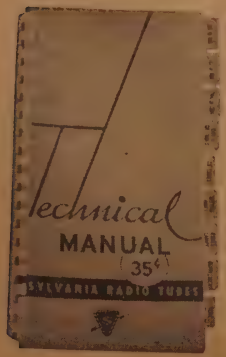

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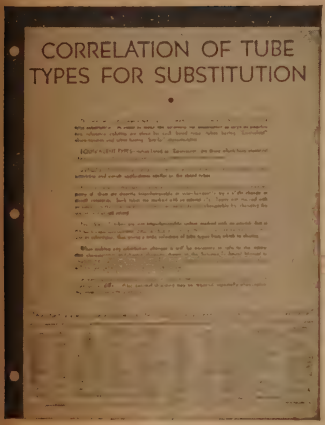

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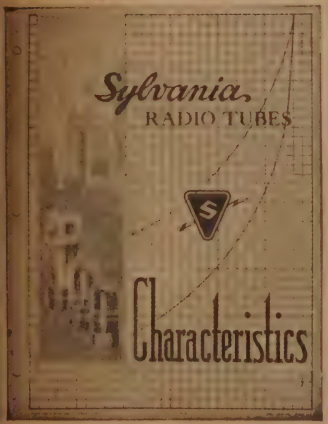

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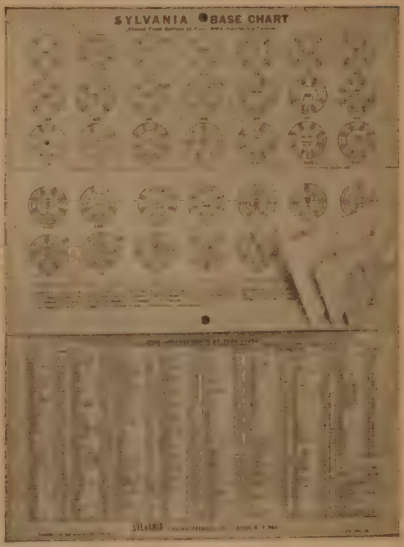

206

BASE CHART

Base views for Sylvania tubes. Cross indexed by types and bases

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205

TUBE CORRELATION CHART

Listing Equivalent and Similar Types.

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211

CHARACTERISTICS SHEET

Characteristics of Sylvania tubes and panel lamps with tube base views.

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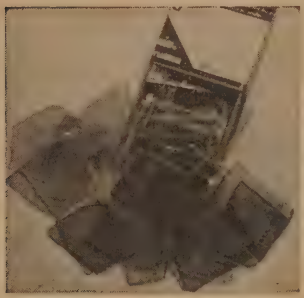
SALES PROMOTION



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